SCIENTIFIC AMERICAN

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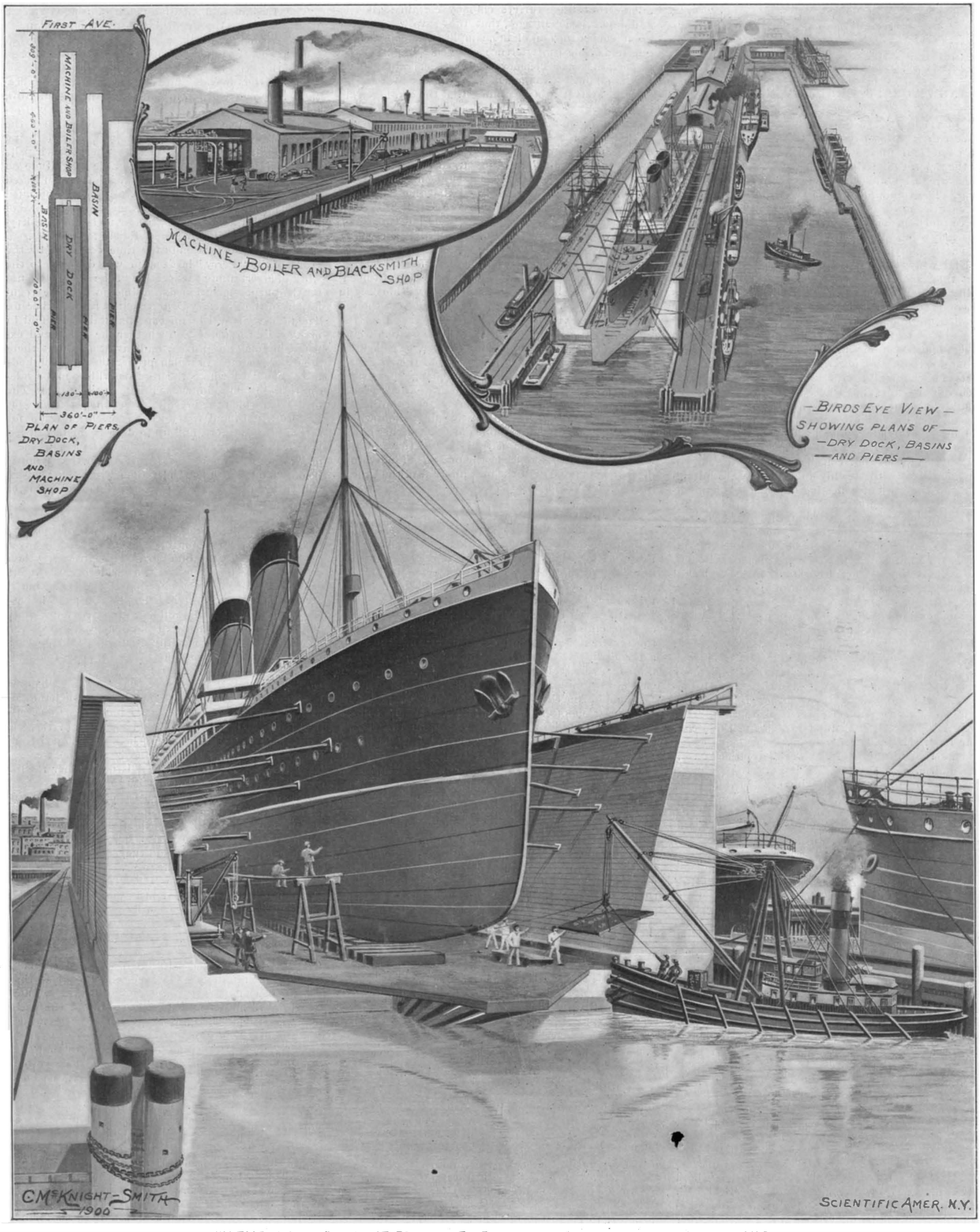
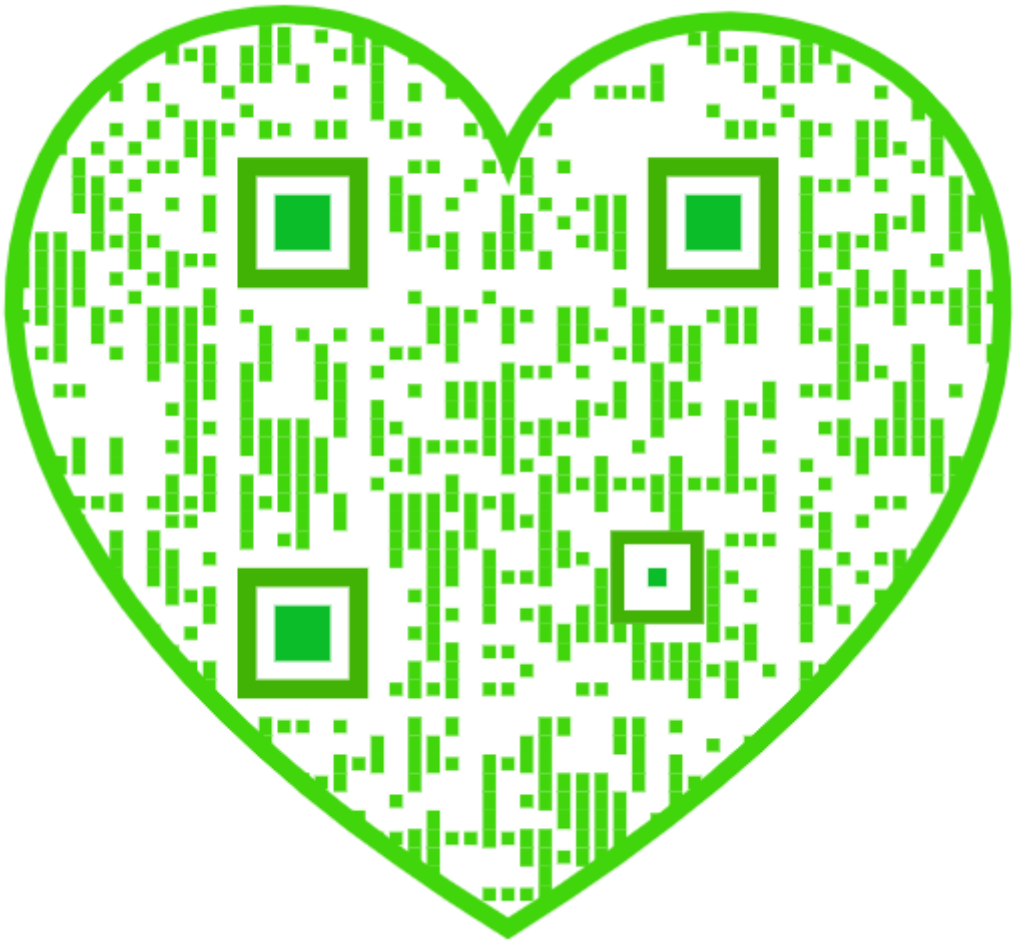


700-FOOT FLOATING DOCK OF THE MORSE DRY DOCK COMPANY, BROOKLYN.—[See page 248.]



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NEW YORK, SATURDAY, APRIL 21, 1900.

UNITED STATES IN THE WORLD'S TRADE.

We can scarcely overestimate the valuable assistance rendered to the foreign trade of this country by the reports from diplomatic and consular officers which are distributed from time to time by the Government. The voluminous annual reports recently transmitted to Congress describe the present condition of commerce and industries in all the countries of the world, especially as affecting American trade; and in his message accompanying the volumes for this year President McKinley says that "it is gratifying to be able to state that they show a marked increase in the practical utility to our exporters and manufacturers of the service of our official representatives, both diplomatic and consular, in promoting trade and presenting a mass of evidence as to the steady growth and popularity in foreign markets of our manufactured goods, as well as of our food supplies, our raw materials and the products of our mines."

There was a time, not so very far distant, when the reputation of our consular service, both at home and abroad, stood at an exceedingly low ebb, and it is, therefore, doubly gratifying to learn from a letter of Secretary of State Hay, which accompanies the President's message, that our consular officers are addressing themselves with steadily increasing zeal and efficiency to the work of collecting information of practical utility to manufacturers in the United States. Our consular as well as our diplomatic officers are greatly assisting American trade by answering through the Bureau of Foreign Commerce specific inquiries from business firms and organized trade bodies. The answers to these inquiries, if of sufficient general importance, are utilized in the form of daily consular reports which are distributed to the press, to chambers of commerce, and other trade organizations. To many it will be as gratifying as it will be surprising, to learn in the words of Secretary Hay that "no other country in the world has so rapid a system of disseminating similar information, or one that so satisfactorily meets the requirements of its industries and commerce." We would draw the attention of our readers to the fact that we publish every week in the SCIENTIFIC AMERICAN SUPPLEMENT a digest of these consular reports, a judicious selection being made which presents the substance of the week's reports in condensed form.

In the course of a general summary of the reports, made by Frederick Emory, Chief of the Bureau of Foreign Commerce, special emphasis is laid upon the fact that since the date of the previous annual review, the commercial expansion of the United States proceeded at a pace which has exceeded the expectations of even those who were most confident of a great development of our export trade. At the same time, a word of timely warning is issued against the temptation to sacrifice the quality of goods to cheapness, the harmful results of which were seen in the falling off of the sales of bicycles, because of the exportation of inferior wheels. At present the word "American" is synonymous with excellence and superior utility in many special lines of goods, and we can conceive of nothing more calamitous to the future of our foreign trade than that the term "American" should become in the least degree associated with the idea of cheapness at the expense of quality.

THE DOUBLE TURRET REJECTED BY THE NAVAL BOARD OF CONSTRUCTION.

It will be in the nature of a surprise to the large and rapidly growing section of the American public that follows with interest the development of our navy, to learn that in spite of the extremely favorable official report on the recent trial of the double turrets of the "Kearsarge," the Naval Board on Construction has decided by a vote of four to one to reject this accredited design in favor of the arrangement of batteries which is to be found upon the "Indiana." The importance of this decision will be understood when we remember that it affects, not merely the two new battleships proposed as part of this year's programme, but also the three battleships of the "New Jersey" class authorized by the last Congress. The "Indiana" battery arrangment, as is well known, places the main battery in two turrets on the center line, one forward and one aft, and carries the eight guns of the 8-inch battery in four turrets placed at the corners of the superstructure. The public will naturally be curious to know why, in face of the favorable reports on the "Kearsarge," the Construction Board should still look unfavorably upon the double-turret system. Briefly stated, the position of the Board is, that while it admits that the trials have shown the practicability of the double turrets from a structural point of view, they prove very little as to its ability to stand the actual test of battle. The Board admits that these turrets embody certain distinctive and desirable advantages, that they save weight, give great concentration of fire, simplify the complicated question of blast interference and secure, in all but one respect, the same efficiency in gun-fire as is obtained by the "Indiana" arrangement; but it declines to accept the system on the ground that the contingencies of a sea fight may reveal possible weaknesses, chiefly of a military character.

Apart from the risk of disablement, which we discussed in our last issue, as far as we have been able to ascertain, the chief objection urged by the Board is that the ship might have to engage an enemy on either side of it at the same time, and that the "Indiana" could devote four 8-inch guns to each broadside, whereas the "Kearsarge" could devote but two. As a matter of fact, however, the probabilities of a ship's being engaged on both sides at once are not great. History and the accepted principles of good tactical formation make it likely that the majority of the engagements will be fought with one broadside only in action at a time. If this is the case, it looks as though the Board were making the mistake of sacrificing the greater for the less and adopting the system whose maximum efficiency may rarely, if ever, be called for.

We are pleased to note, however, that there is a provision permitting the department to change the battery design at any time within six months after the contract is awarded, and we sincerely trust that in the future tests, and in the exhaustive discussion which will take place, the responsible officers, whether of the line or the staff, will stand ready at all times to submerge personal preference or the prestige of individual departments in favor of the best interests of the United States Navy.

AMERICAN VS. ENGLISH MACHINE TOOLS.

If England has been slow to recognize the serious nature of the invasion of her markets by the American manufacturer, it cannot be denied that she is now acknowledging its success with astonishing frankness, and probing deeply into her own methods in the search for the true cause of her failure. The leading technical journals have thrown open their columns for a free discussion, both of the secrets of American success and of the apparent inability of English manufacturers to contend with it. In the leading technical papers, more than one series of exhaustive articles either has been or is now running, which are devoted to a detailed description of American machine tools, shop methods and general system of management. These articles cannot fail to have an important bearing upon the future struggle for commercial supremacy, at least as far as Great Britain herself is concerned. Although the emergency is being met with characteristic composure, evidence is not wanting that many firms are both remodeling their plant and endeavoring to impart a little more elasticity to their system of shop management.

In a recent issue of The Mechanical World, of London, attention is drawn to one feature of English business methods which undoubtedly has contributed largely to the successful introduction of American machine tools. Our contemporary is of the opinion that American machinery catalogues are vastly superior to those which are issued by English firms. It states that in England one rarely meets with a catalogue which gives such detailed particulars, drawings, etc., as will enable the actual construction of the machine to be made out and a probable estimate of its capabilities obtained. English policy seems to be a strictly secretive one, the catalogues being drawn up rather with a view to conceal as much as possible from rival makers than with the object of affording lucid descriptions to the purchaser. The present practice is attributed to the conservatism which still dominates business methods on the other side of the water; and probably our contemporary is correct in stating that in this particular instance this conservatism has much to do with the apparently indifferent showing made by English machine-tool makers in comparison with their American competitors.

The Mechanical World contrasts with the English method, that adopted by the American machine-tool maker, who takes the prospective purchaser into his confidence, giving him in his catalogues information which would enable any builder, if he were so disposed, to make the machine. The English maker objects to this policy on the ground that it is "giving too much away," forgetting that the splendid equipment and excellent management of our large machine-tool makers, enables them to turn out their product at such a low cost, that no one attempting to build these tools for himself could hope to do so as cheaply as they can be purchased from the makers. Our contemporary concludes that when all is done and said "English tool-makers in competing with American concerns will find that they will have to conform to the newer order of things. The American has set the pace, and more up-to-date methods are no longer to be questioned on the score of expediency, but have become absolutely necessary under the stress of competition."

FOX BREEDING ON THE ALASKAN ISLANDS.

The Alaskan and Aleutian chain of islands stretch westward across the Pacific, almost to the mainland of Asia. Although they have been American territory for a long time, they are seldom heard of, with the exception of the Pribylov group, which are important on account of the fur seals and the international complications which have arisen in connection therewith. Now, however, we learn from an interesting report by Howard M. Kutchin, special agent for the protection of the Alaskan salmon fishery, that a new industry is being carried on in these islands. Fox breeding for their pelts is assuming proportions of considerable magnitude on the Alaskan Islands, many of which have been leased for this purpose, and others have been appropriated without the payment of a Government yearly rental of $100 for each island. There are now no less than thirty-five islands occupied by proprietors of fox ranches.

A considerable portion of the time occupied by the cruise of the "Perry" last season was devoted to the work of ascertaining the location of the islands in use for the purpose mentioned, and in enforcing the regulations of the Treasury Department in relation thereto. The industry is still in an experimental stage and in many cases it is a question whether the labor and expenditure may not prove a bad investment, but there are other instances in which proper business methods have been used where the returns will soon be adequate and promise immense profits in the future. The foxes with which the breeding is begun cost from $150 to $200 a pair, and the work has been going on for fifteen years or more, and up to date there have been practically no returns, but as three of the islands have now over a thousand foxes it will be seen that it must be only a question of a short time when the venture will turn out satisfactorily from a financial point of view.

The original project was to propagate the silver grey fox, the fur being more valuable than that of the blue fox, the common rate for a pelt being $50 for the silver grey and $16 for the blue fox. The silver grey is a comparatively ferocious beast, considering the cowardly nature of the species in general, and is also much given to killing its young. It has been almost impossible to domesticate this animal. It is, perhaps, more of a wolf than a fox in its instincts, and the breeding of them has been practically abandoned, there being but a single island where they are now to be found in any number.

The blue fox is practically the only one which is bred, and it is readily tamed, and with gentle handling soon becomes so domestic in its habits as to accept food from the hand of its keeper. Neither of these is a distinct species, the blue fox being developed from the white fox, while the silver grey and black comes from the red. The usual food is fish, either raw or cooked, and corn meal mixed with tallow.

Except for a couple of months in midsummer the feeding is done throughout the year at the average cost of $1.50 per fox. Each of the islands has from two to three keepers for the fox ranch, according to the number of foxes cared for, and they spend their entire time, the year around, in the work.

The skins are taken from November 20 to January 20, the method being to catch the foxes in traps. All females are released after marking them. For each six females one male fox is turned loose, the finest animals being selected for breeding purposes. The killing age is about eighteen months, although fox skins may be had as young as eight months, and if especially well grown the animals are sometimes killed at that age. The semi-domestication of the fur-bearing animals affords the only possible escape from the early extermination of a large part of those species which now provide the most costly and luxurious of wearing apparel. It seems reasonable to suppose that the Alaskan fox industry, in which $100,000 is now invested, may be the beginning of a great and profitable business, the islands of Alaska being particularly fitted for the experiment, and very few of them are of the least value for any other purpose. It is thought by experienced fur men that it might be entirely feasible to introduce the Russian sable and other of the more valuable martin species into Alaska for propagation on the same lines as the fox experiment, and whatever the government can do in the direction of encouraging the development of fur raising, will be a step well and wisely taken. In one island bears are being raised, and the proprietor of the bear range has a dozen or more animals.

A NEW HYDROCARBON CUPRENE.

It has been recently shown by Messrs. Sabatier and Senderson, of Paris, that acetylene has a marked action upon copper in a finely divided state, and they have obtained a new product in the shape of a solid hydrocarbon. Pure and dry acetylene gas is made to pass through a tube containing a certain quantity of reduced copper in the form of a fine powder. When the copper is heated to about 180° C. it absorbs the gas with great rapidity. In one experiment a current of gas, having a velocity of 20 cubic centimeters per minute, was entirely interrupted for more than 20 minutes, due to its absorption by the copper; after a time the current of gas is re-established, but slowly at first. During the first part of the action a colorless liquid is condensed upon the cold parts of the tube, consisting especially of ethylenic carbides; the microscope shows that the copper has not as yet changed; but as the current of gas re-establishes, the copper begins to swell rapidly, assuming a lighter color, and soon fills the tube entirely, closing off the passage of the gas. At this stage the liquid hydrocarbons condensed in the tube have a greenish color and appear to consist of a mixture of hydrocarbons of the ethylene and the aromatic series. They give with concentrated sulphuric acid an intense red coloration, and become gradually solid upon exposure to air. As to the gases which leave the tube, analysis shows that they are formed of a mixture of hydrogen, ethylene, propylene, etc. The same reactions may be obtained by using copper in the form of foil or wire, this being heated in a current of acetylene to 200-250° C. The copper becomes covered with a layer which is at first brown, then becomes yellow as its thickness increases. If a part of the brown substance is taken and heated in a tube in a current of the gas, it soon begins to swell, and may fill the whole of the tube. This process is recommenced until no further swelling is observed, and a substance is finally obtained which is not modified by the gas. This project is a yellowish solid more or less dark in color, which, under the microscope, appears to consist of an assemblage of very fine filaments intermingled. The mass may become adherent by a slight pressure, like asbestos, which it somewhat resembles in appearance. It burns with a short and smoky flame, giving off an aromatic odor and leaving a slight residue of copper oxide. This body is a hydrocarbon in whose mass is found the small quantity of copper which has contributed to its formation; the proportion of copper is small, being but 2 to 3 per cent. The product has a definite composition, and analysis gives the empirical formula $C_7 H_8$. On account of its origin the experimenters proposed to give the name of cuprene to this new hydrocarbon. It seems to have no appreciable volatility, and when heated it decomposes above 400° C., giving off gases and leaving a carbonaceous residue. This body seems to be almost insoluble; sulphuric acid has no appreciable action upon it, and nitric acid attacks it but slowly. The experimenters propose to continue their investigations upon this singular body.

THE PEANUT INDUSTRY.

The peanut crop of 1899 is nearly a million bushels heavier than the crop of the preceding year. The total crop will, it is thought, reach nearly 4,500,000 bushels of 22 pounds each. The bulk of the crop is produced in Tennessee, Virginia, and North Carolina. It is not generally known that the American yield constitutes but a small proportion of the peanut crop of the world; the exportation from Africa and India to Europe is nearly 400,000,000 pounds annually, half of which goes to Marseilles to be made into oil. The running variety is a typical American peanut, says The Evening Post, from which we derive our information. Its vines are large, with spreading branches growing flat on the ground. The pods are large and white. There are many more varieties grown, some of them being upright bushes instead of vines. The so-called Spanish nuts are used principally by confectioners. They have small, round kernels, and are very fine. The crop averages annually 150,000 bags of 110 pounds each. It is only within the last few years that peanuts have been shelled by machinery. With the increase of their production machines have been taking the place of the old slow-going methods.

To grow peanuts successfully requires a calcareous soil without too much lime, and under such conditions, the yield runs from thirty to forty bushels per acre. There are about twenty peanut factories in America and the capital required for starting a mill is small. One factory handles 5 tons of peanuts daily, producing 235 gallons of refined oil, 175 gallons of crude oil, 3,680 pounds of flour and meal and 3,300 pounds of stock food. An extensive grower does not take the trouble to separate peanuts from the vines and dirt when he has dug his crop but sends everything to the factory. They are put into the mill, vines, dirt and all, and are then placed into a hopper and fed into a revolving cylinder which cleans them by friction, the dirt, leaves and vines being taken out by a suction pipe. The nuts remain in the cylinder and they are fed out upon a revolving slat-table, the slats resting upon canvas from which negro women pick out those of the first grade which are known as "fancy." The selected nuts are fed from the table into chutes and then into bags. The remainder are run over a second revolving slat-table, fed into chutes and packed into bags labeled "extras." Four grades are sorted, the the first three being sold to dealers and the fourth to confectioners for making burnt almonds and cheap candies. America does a heavy export business to Europe in peanuts. Foreigners do not eat them as Americans do, but grind them into meal. They also make oil of them which is resold to Americans as olive oil. The nuts are very rich in oil, 40 per cent of the shelled nut being oil. After the oil is extracted the cake which remains is sold for $30 a ton in Germany and fed to cattle and sheep. Peanut butter is one of the latest uses of the peanut. It is made by grinding the nuts very fine and reducing the mass to a pasty substance, a portion at least of the oil being removed. Salt is added as flavoring.

COTTON'S GREAT FUTURE.

The most remarkable advance in cotton for a quarter of a century has been made this winter, and our Southern cotton belt is in the process of a transformation that can hardly be comprehended by those not directly interested in the business. For the past three years cotton has been selling at 6 and 6½ cents per pound, and at that price there was little profit in the staple crop of the south; but right on top of the pessimistic predictions that cotton would never again prove a paying crop in this country, the price advances to 9 and 10 cents per pound. This advance does not represent a proportionate gain to the grower, for much of the crop was harvested and sold before the high prices were realized. It is estimated, however, that 6,000,000 bales of the crop sold at an average of 7½ cents per pound, or $35 per bale, and 3,000,000 bales at 9 cents, or $45 per bale. This gain represents an enormous amount of wealth that has gone to the Southern cotton farmers this winter.

But the future of this industry is even more promising than the present. The sudden increase in the cotton valuation naturally attracted the attention of thousands of farmers who had decided to give up cotton growing, and it has been feared that the acreage will be so largely increased that there will be a big slump in prices next year, and instead of a great gain, the growers would actually lose. Under the present system of "future" trading, the cotton farmers could sell their new crop for delivery between next October and January at 8 cents, or $40 per bale. This would make the normal yield of 11,000,000 bales sell at $440,000,000, an increase of some $80,000,000 over the present year. The farmer is thus enabled to assure himself of 8-cent cotton even before the crop has been planted, and a profit large enough to make his industry one of the best paying in the agricultural regions of the country.

The new acreage of cotton will undoubtedly be the largest on record. There are safe indications of this in statistics already collected by official authorities, and the amount of land in the South that will be planted with cotton cannot fall far short of 26,000,000 acres. Last season the cotton crop was a small one, amounting to 9,000,000 to 9,500,000 bales, while the two preceding years it reached 11,250,000 bales. But it was not this difference in the yield of the two years alone that caused the unexpected boom. India's crop proved almost a total failure also, while the Egyptian crop has more recently been threatened with a similar fate. In addition to these causes the world's consumption of cotton has increased, and this is likely to continue for some time to come. A combination of such factors is directly responsible for the advance in cotton prices which transform the conditions of the South in a gratifying way.

Co-extensive with the improvement of the cotton field and better has been the development of cotton mills in the South. The mills of North Carolina alone employ 40,000 operatives, who have been raised from a miserable condition of poverty to one of comparative affluence. Ten and fifteen years ago these poor operatives could barely make $180 a year on the average off their small farms. They rarely had any ready money, and they dragged along from year to year with but few of the benefits of modern civilization. To-day in the cotton mill districts there is hardly a family that cannot make from $300 to $400 annually, and, many of them find little difficulty in earning from $500 to $1,000 a year. The advance in the price of cotton distinctly helps and brightens the future of most of these cotton mill settlements in the South, for besides working in the factories nearly every family has a few acres planted with cotton, which some member of the household finds time to cultivate.

There is hardly a crop in this country that distinctly helps general business more than cotton. It almost equals in this respect king corn or wheat. The farmers, the small merchants, the large dealers, shippers, machinest, truckers in cities, operatives in mills, and clerks and assistants from New Orleans to New York and from New York to Liverpool, find a distinct benefit whenever cotton moves upward and prices promise good returns to the grower. If our trade in the cotton goods in the Far East proves as large and remunerative as merchants anticipate now there will be new channels of commerce to feel the quickening impulse of a large crop of 8 and 10 cent cotton. G. E. W.

THE ENTRANCE TO THE PARIS EXPOSITION.

The architects who had charge of the buildings of the Paris Exposition had a unique opportunity offered to them by the splendid location of the monumental entrance to the Paris Exposition. It is too early as yet to criticise the architectural effect of this building, but the plans show a very novel means of handling a large crowd, A considerable proportion of the millions, who will visit the Exposition, will pass through this monumental entrance. The building itself is well known by the many engravings, which have been published of it, and consists of a steel frame which is overlaid with staff, which will be painted in many colors. Its form is that of an equilateral triangle with the angle truncated. Each side is formed by an archway, and the great arches are each 65½ feet wide and 60 feet high and carry a circular crown which forms the base of the flattened dome that covers the space enclosed within the triangle. In the truncated angle of the triangle which forms the inner end of the gateway, there is a door which is exclusively reserved for royalties, so that it is indeed a "Gate of Honor." The crowd is gradually concentrated by the exedra so that they pass through an entrance 66 feet wide, and then the crowd divides up, part going to the right and part to the left. The entrance and ticket-selling booths are arranged in a semi-circle around the dome, so that each division really resembles the rib of a fan. The ticket-selling booths are arranged in pairs. In other words, the ticket-selling booths are placed end to end, instead of being placed back to back. The passage leading the public to the front of the ticket boxes are arranged so that the width is sufficient for only one person to pass at a time. The floor is made with a slight incline so as to check the rate of the movement of the visitors, which will be particularly necessary on special days, when the crowd will be enormous. It is expected that with this arrangement 40,000 persons can pass through the entrances an hour. This may, however, be doubted, and it will be very good work, if 20,000 persons an hour can be accommodated at the main entrance. The plan shows 40 passageways and eighteen pairs of ticket selling booths each accommodating two persons.

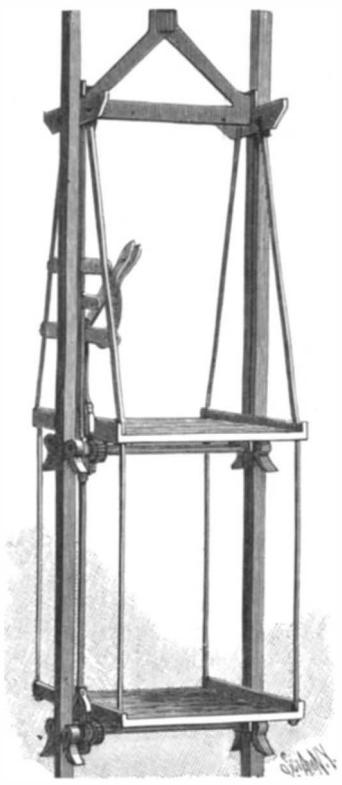
DEATH OF FRANK H. CUSHING.

In the death of Frank H. Cushing, one of the most prominent of American ethnologists, American science has suffered a most severe blow. Mr. Cushing had attainments of a high order and he will be much missed; he was never robust, but until a few days ago his scientific researches were conducted with great activity. Mr. Cushing was born in 1857, at Northeast, Pa., and while a boy showed great interest in Indian relics and he made many trips in the neighborhood of his home and in New York State to gather archæological and ethnological specimens. When he was only eighteen years of age his work was brought to the attention of the late Spencer F. Baird, who was then Secretary of the Smithsonian Institution, and in 1875 he went to Washington as an assistant in that institution. He had charge of the ethnological exhibit at the Centennial Exposition of 1876, and in 1879, he accompanied an expedition from the Smithsonian Institution to investigate the Pueblos of New Mexico, and at his request was left at the Pueblo of Zuni, where he lived almost continuously for six years. He became an adopted member of the Zuni tribe; he learned their language and was initiated into the secret order of medicine men, known as the "Priesthood of the Bow." This was a phenomenal achievement and gave him an insight into the inner life and customs of an Indian tribe, more intimate than had ever been gained by anyone up to that time. He returned to Washington in 1884 and began to work up his voluminous notes. Two years later he was made Director of the Hemenway Southwestern Archæological Expedition. Extensive excavations were made in South Arizona and New Mexico, and the large collection of objects of prehistoric art which he gathered is in the Peabody Museum at Cambridge, Mass. This work took up two and one-half years of his time, and then Mr. Cushing returned to the United States Bureau of Ethnology to supervise a memoir on the Zuni myths printed by the Bureau. Three years later he became Director of the expedition fitted out by Mrs. Phœbe A. Hearst and the late Dr. William Pepper, conducted under the auspices of the National Museum, the Bureau of Ethnology and the University of Pennsylvania. Several months were devoted to exploration and excavation of the remains of the dwellings in the Key Islands, on the coast of Florida, which resulted in the collection of many remarkable objects, and in due course followed a preliminary account of Mr. Cushing's researches. Mr. Cushing contributed many papers to magazines and was a most interesting and accomplished lecturer.

A CONTROLLING APPARATUS FOR MINE ELEVATORS.

Letters patent have been secured by John J. Cook and Walter W. Wishon, of Butte, Mont., for a controlling device which is particularly adapted to mine elevators, and which is operated by means of a hand-lever.

Below each deck of the car two shafts are mounted, the ends of which carry dogs having toothed cam-surfaces, designed to grip the guide-rails between which



A CONTROLLING APPARATUS FOR MINE ELEVATORS.

the car moves. Near one end of each shaft a pinion is fixed. The pinions are located opposite each other and mesh with racks extending vertically between them. The racks are connected by links to move in unison and are operated by a hand-lever provided with a latch-spring pressed into engagement with an apertured quadrant. The lever and its latch can be thrown to any desired position, so as to engage and disengage the dogs and the guide-rack.

The device is simple in its construction and efficient in its operation.

The Pollock Life Saving Competition.

It will be remembered that Anthony Pollock, a patent attorney of Washington, D. C., and his wife, were among those lost on the ill-fated steamship "Bourgogne," and that the Pollock heirs decided to offer a memorial prize of $20,000 for the best life-saving device in case of disaster at sea, and we have already given the various rules formulated, governing the competition. A committee of naval experts was appointed to take charge of the devices and select those which were considered worthy of being forwarded to the Paris Exposition. One hundred and twelve life-saving devices were received from all parts of the United States, and out of this number, the committee has selected ten which will be sent to Paris and placed on exhibition. Among the competitors whose devices have been selected is Chief Constructor Philip Hichborn, United States Navy, who sends his life buoy; Assistant Naval Constructor Francis T. Bowles, United States Navy, who presents an electric closing, water-tight, bulkhead-door; John A. Aniello, New Orleans, a life-boat; J. C. Angevine, Los Angeles, Cal., life jacket; N. H. Borgfeldt, Brooklyn, N. Y., steel belt to prevent the upsetting of life boats; W. J. Kennedy, New York City, boat, hoisting, lowering and detaching apparatus which was specially commended by the committee as the best device for getting boats clear of the ship when lowered with passengers; Arthur W. McGray, Boston, Mass., presented a design for a ship; W. McKinnon, a device for swinging out life boats; Robert Nevill, Washington D. C., the eophone sound condenser; C. F. Sultemeyer, Chicago, life boat. It is announced that persons whose devices have not been selected can send them to Paris at their own expense and they will be placed on exhibition. It is gratifying to note that several of the successful exhibitors secured their patent protection through the Scientific American Patent Agency.

It has been decided that the Scottish Geographical Society shall send a party to work in Antarctic fields. Researches will then be in progress on all sides of the Polar area

A SIMPLE FORM OF WIRE-HANGER.

In the accompanying illustration we present a new form of wire-hanger for suspending overhead trolley-wires or other wires and cables. The chief object of the construction is to hold the wire firmly without bending the hanger, and so to arrange the device that it can be moved along a wire whenever it may be desired. The hanger constitutes the subject of an invention patented by James W. L. Jaques, of Salt Lake City, Utah.

The hanger consists of a casing open at its top and ends, but closed at its bottom to receive the wire. Clamping blocks, serrated in order to grip the wire tightly and provided with inclined slots to receive the clamping-bolts passing through the sides of the casing, are designed to slide in opposite directions within the casing in order to engage with their upwardly and inwardly sloping adjacent ends the correspondingly formed surfaces of a central wedge-block. Through the sides of the casing and through the vertical slot in the wedge-block a bolt passes.

The casing is first slipped over the wire and the wedge-block placed in position with its bolt passing through the vertical slot and casing. The slidable clamping-blocks are then placed in position on either side of the wedge-block, with their bolts likewise loosely passing through the casing and inclined slots. By drawing upwardly on the central wedge-block, or downwardly on the wire, it is evident that the wedge-block will move the clamping-blocks outwardly, causing the upper inclined walls of the slots to engage the bolts. When the wire is tightly gripped between the serrated clamping-blocks and the bottom of the casing, the bolts are tightened so as to hold the parts permanently in position.

It may sometimes be necessary electrically to connect the adjacent ends of two wires with a hanger. The clamping-blocks are, therefore, provided with openings to receive the upwardly-turned ends of the wires.

THE COMING ECLIPSE.

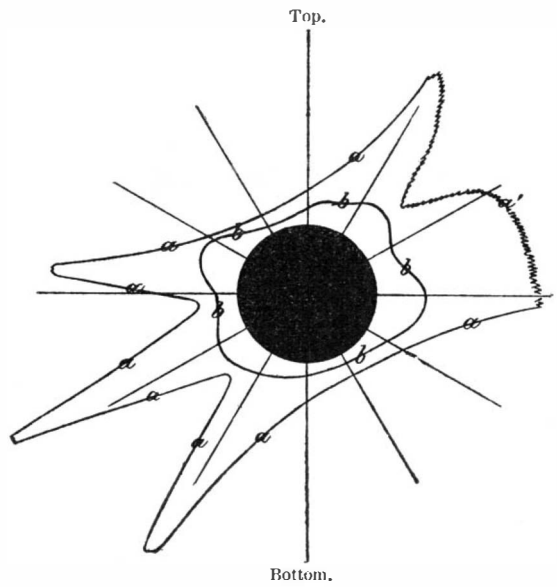
The total eclipse of the sun on May 28, instead of passing over the sparsely settled regions of the world, will cross the States of Louisiana, Mississippi, Alabama, Georgia, South Carolina, and North Carolina, and will even touch Virginia. The track of totality begins on the Pacific Ocean just west of Mexico, enters the United States near New Orleans, and passes in a northeasterly direction until it reaches the sea at Norfolk and Cape Henry. Its path then crosses the Atlantic Ocean and touches Portugal, Algiers and North Africa, and will terminate near the northern end of the Red Sea. The eclipse will last 1 minute and 12 seconds near New Orleans, and 1 minute and 40 seconds near Norfolk. It is probable that large numbers of people will take the railroads to points where the eclipse can be seen. A number of experimental stations will be established by the government along the path of the eclipse. The necessary apparatus is now being gathered and arranged, and men specially adapted for the work are being engaged and are trained. Congress has allowed $5,000 to the Naval Observatory and $4,000

A SIMPLE FORM OF WIRE-HANGER.

to the Smithsonian Institution for this purpose. The Naval Observatory will send out two expeditions. They will probably be located in North Carolina and Georgia, 200 miles apart. The Weather Bureau is collecting data of the weather conditions in past years in the month of May for the localities along the line of totality. So far they show there is less chance of cloudiness in Central Georgia and Eastern Alabama and this is, therefore, the best region for locating the eclipse stations. The stations will be occupied two or three weeks before the eclipse, and the part which each man will take will be thoroughly rehearsed. It is very imperative to make no mistakes during the minute and a half when observations can be made.

The Smithsonian Institution officers will be under Prof. S. P. Langley, those of Princeton University under Prof. Young, those of the University of Pennsylvania under Prof. Stone, and the Yerkes Observatory will conduct the expedition with Prof. Hale at its head. Nearly every college and scientific institution in the country will be represented, and probably 100 expeditions will observe the eclipse in the path of totality in addition to large numbers of scientific amateurs, who will make extended observations. Prof. Brown, of the Naval Observatory, considers that there will probably be thousands of these unattached amateurs. It should not be forgotten that one of the finest sets of photographs of the eclipse in India, in 1896, was taken by an amateur with a home-made camera. The expeditions sent out by the Naval Observatory will consist of only five or six observers. The same observatory has issued a little pamphlet containing a map of the path of the eclipse showing the various towns, railroads, streams and elevations, and it contains suggestions for observing the eclipse.

Doubtless many of our readers will be interested in knowing how to make amateur observations. Preliminary preparations should be carefully made where it is intended to sketch the corona with the naked eye. Those who expect to make a sketch of the corona unaided, will have to confine their attention to sketching outlines or to some other particular feature, otherwise they will result in hasty and inaccurate work. Co-operation of groups from two to five sketchers is strongly commended. A sheet of paper of convenient size, of say 9×12 inches, should have drawn upon it a black disk, 1¼ inches in diameter, to represent the moon, with straight lines radiating at an angle of 30 degrees, as shown in our diagram. The positions of the various parts of the corona, as seen projected against the sky are best referred to a vertical line obtained by mounting a plumb line so it is seen over the moon's center. The diagram upon which the drawing is to be made it is to be placed upon any convenient support so that the lines marked "Top," "Bottom" shall be in the plane of the plumb-line, the top part corresponding to the top string. The diagram also shows the outline method of sketching in the forms of the inner and outer corona, where the principal stress is laid upon the inaccuracy of the position and form. It is a reproduction of a drawing made by E. J. Stone in 1874. *a*, *a*, *a*, shows the outer corona, the part *a'* indicating a faint and undefined boundary, *b*, *b*, *b*, shows the inner corona. This sketch forms no part of the diagram to be used in the coming eclipse, but is placed on the diagram



OUTLINE METHOD OF SKETCHING IN THE FORMS OF THE INNER AND OUTER CORONA.

PATH OF THE TOTAL ECLIPSE OF THE SUN, MAY 28, 1900.

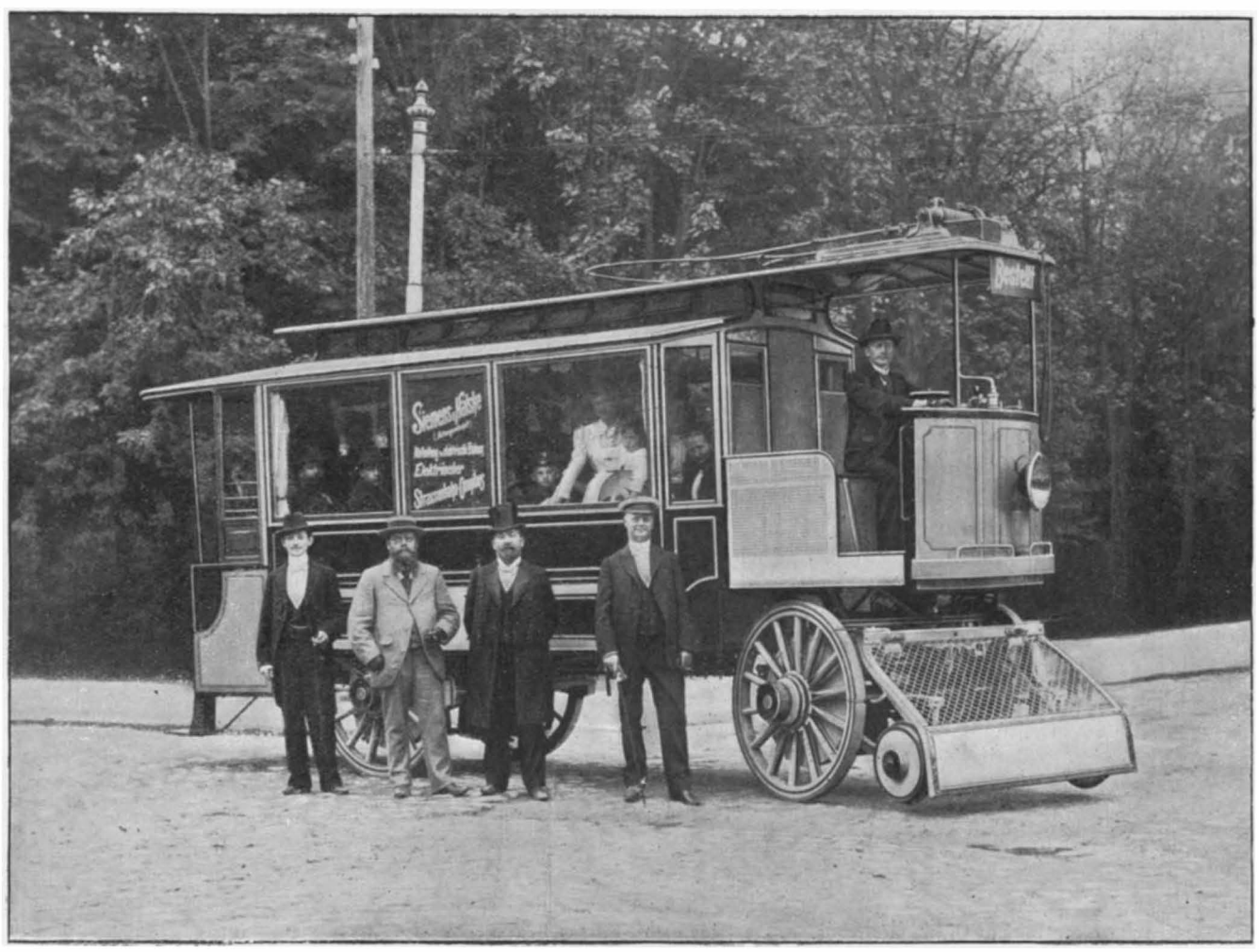
only as an illustration of the method. The dimensions of the various parts of the eclipse can be made with accuracy by estimating them in terms of the moon's diameter as a convenient unit. The party should practice together beforehand, each sketching only his proper quadrant from a corona drawing suspended at the angular height of the sun. The time of exposure of drawing should be slightly less than the known duration of the eclipse. White chalk on purplish blue paper gives admirable results. On eclipse day the sketchers should avoid fatiguing their eyes by too much observation of the preceding partial eclipse and should rest the eyes for the last five minutes before absolute totality.

Photographs of the corona are of great scientific value, and may be obtained with instruments of moderate dimensions. Almost any good rectilinear lens may be used. One with an aperture of 2⅛ inches and of a focal length of 32½ inches proved very satisfactory in the Indian eclipse expedition of 1898. For plates of ordinary sensitiveness exposures of one or two seconds are ample. It is better to use a plate of normal sensitiveness instead of an extra rapid one, and to lengthen the exposure in proportion, because a slower plate is easier to handle and permits of a more restricted and prolonged development and is less liable to accidental fogging. Photographs taken with amateur instruments are, of course, not as valuable as those taken with instruments provided with a driving clock or other device for keeping the image stationary on the plate. In focusing, the instrument should be pointed at a well-defined object distant say from one-quarter of a mile to a mile, and the object brought to a short focus for center plate. The image of the sun is really a small object and occupies but a comparatively small part of the center of the field. The focal length of the camera in inches will give roughly the diameter of the sun's image in hundredths of an inch. Negatives should not be retouched.

While a proper telescope is desirable, small spy-glasses and opera glasses may be used. For the first and last contact shade glasses are necessary. The usual and most objectionable color for a shade is red, either a neutral tint or green should be used, and deep blue is also recommended. Instruments specially intended for observing the sun are always provided with arrangements for getting rid of the excessive light and heat without diminishing the aperture, and often without using shades. Special care must be taken that the temperature of the tube is the same as that of the outside air. The first contact is a slight indentation in the sun's limb, and it usually attains some size before the observer, unless he is specially trained, sees it. The internal contacts, or beginning and end of totality, are phenomena of such a definite character that the instant of their occurrence can be noted within a small fraction of a second. For a minute or two before the predicted time of second contact the sun's thin and now fast-waning crescent should be carefully watched through a neutral or green shade glass. Presently the crescent will become a mere thread of light, which will rapidly shorten and suddenly disappear. The approach of the third contact will be heralded by the rapid brightening of the chromosphere at the point of the moon's limb, where the sun is about to reappear, and two or three seconds later a sudden burst of light will announce the contact itself, and with it the termination of totality. The observation of the fourth contact is a simple matter. The segment cut out of the sun by the retreating limb of the moon is carefully watched as it becomes less and less, and the instant of its final disappearance is noted as the fourth contact. Very precise directions are given by the Naval Observatory authorities for amateur telescopic observing parties, and are sent by them on request.

In our chart the shadow path is crossed at more or less uniform intervals by straight dotted lines which terminate in the north and south limits of totality. Each of these lines is approximately the locus of all points for which the middle of total eclipse occurs at the moment of Greenwich mean time indicated thereon. The adopted interval is five minutes. The longer dotted lines include points for each. Either the beginning or ending of partial eclipse will occur at the moment indicated.

SIEMENS AND HALSKE OMNIBUS DRIVEN BY OVERHEAD CURRENT.



THE SIEMENS AND HALSKE OMNIBUS DRIVEN BY ACCUMULATOR.

A COMBINED AUTOMOBILE AND TRAMWAY OMNIBUS.

A vehicle of a very novel form, designed by the well-known German firm of Siemens and Halske, has been used with considerable success in the city of Berlin. The vehicle is an electrically-driven omnibus which differs from other electromobiles in so far as it derives its power both from accumulators and from two overhead trolley wires, so that it can travel in streets without tracks as well as upon the rails of a tramway.

The omnibus, since it can be used with or without tracks, is admirably adapted to connect all parts of the city with one another. For it can travel, not only in those streets too narrow to permit the laying of tracks, but also in the restricted avenues in which the laying of rails is prohibited.

When the omnibus runs upon the tracks of an electric line, it takes the current necessary to actuate its motors and to charge its accumulators from the feed-wire above; but when it travels in rail-less streets, the conducting loop and its carrier are lowered, and the current from the accumulators is used.

The vehicle possesses the advantages over electric automobiles hitherto constructed of employing lighter accumulators and using a smaller amount of current when running on tracks, owing to the slight resistance. Moreover a high speed is attained,

and unnecessary long stops for charging the battery avoided.

In its external appearance the vehicle differs from the usual horse-drawn omnibus in the smaller width between the rear wheels (rendered necessary by the gage of the tracks) and in the arrangement of the front wheels, which are mounted directly beneath the driver's platform. In advance of the front wheels a small truck is arranged, carrying two small, flanged bogie-wheels, which can be raised and lowered, and which serve the purpose of guiding the omnibus when running on rails. Directly over the front axle, on the roof of the vehicle, is the loop peculiar to Siemens and Halske electric cars, serving the purpose of conducting the overhead current to the motor and battery.

The fifth-wheel of the omnibus, mounted on balls, can be turned through such an angle that the wheels of the front truck are at right angles to the longitudinal axis of the vehicle. By reason of this arrangement the sharp corners of very narrow streets can be easily rounded.

The brakes consist of one friction brake for the rear wheels, and an electric short-circuit brake connected with all four wheels and operated by the same switch-handle used in starting the vehicle.

The four wheels are each provided with a motor. The storage battery by which these motors are driven consists of 200 cells.

In certain streets of the city of Berlin the installment of overhead wires is permitted, but the laying of tracks prohibited. Under these circumstances, slight modifications in the construction of the omnibus must be made. The accumulator and bogie-truck are discarded. The omnibus derives its power from the overhead current, two wires being necessarily provided, one to feed and the other to return the current.

At a public test made before the city authorities, the Siemens and Halske omnibus attained a speed of 25 kilometers per hour (16 miles).

Hollow Glass Vessels.

Hitherto it has not been possible to obtain glass vessels of large capacity for chemical purposes owing to the fact that the masses are too heavy to be handled by the blowers. In a new German process the glass is ladled out and poured on an iron table with an adjustable framework. The table plate is hollow and communicates by a number of perforations with a compressed air cylinder. A groove of suitable shape is provided on the plate. This groove is filled with glass and covered in afterwards so as to act as a support for the glass when the plate is turned over. When this is done the glass begins to separate from the iron plate and to bulge out. The admission of compressed air hastens the process. When a glass kettle is to be formed a circular groove is used and molds may be applied at the same time. Imitation crystal vessels are made in the same way, says The Trade Journals' Review, the start being made with the glass plate as before. A sheet of asbestos paper impregnated with water is then applied to it. The two are then taken from the iron table and the respective mold is fixed over the glass surface, cutting off a slab of the proper size. The asbestos begins to steam and the vapor forces the glass into the mold. The process works quickly and gives beautiful results. To produce a colored pattern on the glass, the design is made on thin paper and powdered glass is used as a coloring matter. The glass side is applied to the hot vessel, the paper is burnt in an instant and the colored pattern fixed in the glass. The new process also affords advantages for plate glass manufacture.

Sandglasses.

Strange to say the sandglass is still used to measure varying periods of time. The size depends upon the purposes to which they are to be put. The hour glass is still in use in the sickroom and in the music room, in both places affording a sure and silent indication of the progress of time. Half-hour glasses are used in schools, and fifteen minute glasses are used for medical purposes, and the sandglass also goes into the kitchen as an aid to exact cooking. There are also ten minute glasses, five minute glasses and three minute glasses, the two latter being used to time the boiling period of eggs. The three minute sandglass is called an "egg boiler." Sandglasses, says The New York Sun, are also used for scientific purposes and on shipboard, being more convenient than holding a watch.

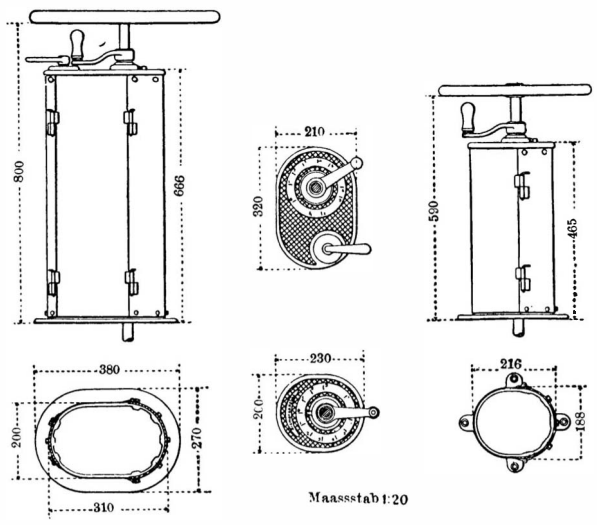
They are made in this country and are also imported from abroad. The sand is carefully prepared by a thorough cleaning, including boiling. It is then baked dry and then ground into the requisite fineness and uniformity, as sharp sand would be likely to become wedged in the opening between the two sections of the glass. The sand is then introduced into the glass through an opening left for that purpose in the end of one bulb, the opening then being sealed, the right quantity in each sand glass is gaged by actually timing the flow from one part of the glass to the other, and every glass is individually treated like a good thermometer. The glasses are usually mounted in cylindrical frames or holders so that the twin bulbs can be seen at all times. The type usually sold is that represented in pictures of Father Time. The outer glass appears very large to those who have never seen one standing 6 or 7 inches high, but this seemingly large size is necessary in order to accommodate a considerable quantity of sand.

THE TURQUOIS MINES OF PERSIA.

About thirty-five miles from Nishapour in the Khorassan are the celebrated turquois mines of Persia. The only mines in the world producing this fashionable stone. They are situated in a mountainous region 5,000 or 6,000 feet above sea level and employ perhaps 1,500 persons. The concession is about 40 square miles in extent, including a few villages, the turquois, salt and other mines.

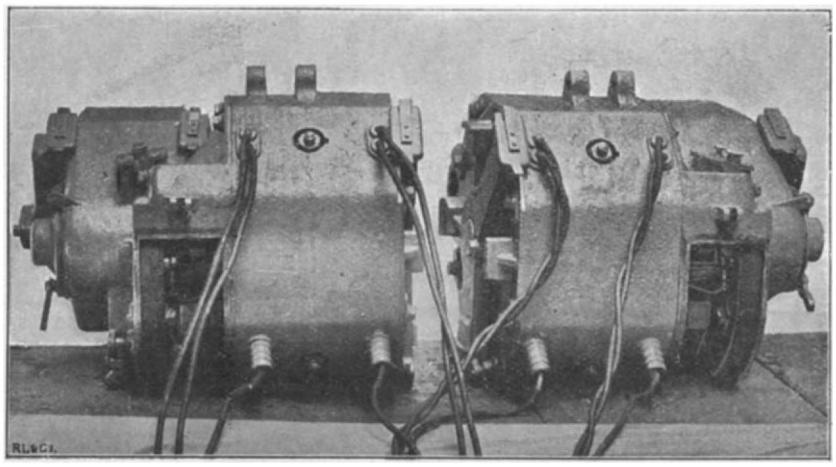
This tract is exploited by a local chief and banker in partnership who pay an annual rental of 14,000 tomaus or $14,000. The lessees work only three mines, the "Reish," the "Zaki" and the "Ali Merzai" and sublet twelve others.

On approaching from Nishapour one ascends gradually among low hills until within 1,000 feet of the summit of the range. All of the mines being on the southern face of this last eminence. The slope is deeply cut by ravines and to go from one mine to another necessitates some hard climbing.



Controller-Switch for Two Motors.

Controller-Switch for One Motor.



7½ H. P. MOTORS, 1,000 REVOLUTIONS. WEIGHT, 330 KG. (726 POUNDS).

The underground mines are opened in the solid rock by picks and by blasting. There are also Khaki (earth) mines or surface diggings in the débris of the mines, or in the detrictus of the rocks washed down by the rains and extending a mile or so over the plain from the foot of the mountain. In former times the mines appear to have been well worked. Remains of vertical shafts for lighting and ventilation are to be seen, while entrance was evidently had by means of galleries running in on the side of the mountain.

When the Safavian dynasty came to an end, about the first quarter of the last century, the villagers began to farm the mines and, in order to save time and labor, cut away the supports in the mines wherever a gem was found so that many, the Maliki, Zaki and Mirza Ahmedi among them, caved in.

The ancient Zaki mine was of considerable depth. The bottom of the present working is 120 feet beneath the surface but as yet no signs of the old mine appear. Several attempts along this line have been made. Owing, however, to lack of funds or energy they were abandoned.

About 100 miners are employed at the three mines mentioned, receiving from 2 to 3 krans per day. (A kran equals ten cents.)

The Reish is the only mine in full operation, if entire lack of methods and rational work can be so termed. The lessees only desiring to recoup their outlay. It produces the greater part of the world's supply of turquois, having a weekly output of over $400.

A cave, 36 feet across, serves for the entrance of this mine from which a shaft of about 15 feet in diameter descends.

The manner of working is primitive in the extreme. Two men sitting at the opening of the shaft, their backs braced against the cave wall, turn an old wooden wheel with their feet. From the wheel depends a small sheepskin bag capable of holding perhaps a peck. A third man received the full bag, empties and reattaches it to the rope. The wheel is suddenly released and the bag drops to a depth of 40 feet where other workmen on a narrow ledge repeat the process. The total depth of the mine being from 80 to 90 feet.

The miners descend to their work a portion of the distance through a diagonal tunnel piercing the shaft. From this point they scramble down the rough shaft. On a narrow shelf of rock near the mouth of the cave workmen break the fragments of rock with small hammers. The stones when found are put aside to be sent to Meshed in the rough state.

The débris from the mine is sifted over by boys perched on other ledges. This mine is very productive, but the stones are not of first-class quality.

Many mine openings are mere burrows, barely large enough to admit a man. Such is the case with the Abdar Rezai which formerly produced the finest stones in the world, of deep sky-blue color and unfading luster. Some years ago it caved in and now few first-class stones are found. The work in the Khaki mines is usually done by women and children who simply dig up and look over the earth. They find, perhaps, half a dozen turquois a day. Even the poorest stones are prized by the Orientals who wear them set in tin rings. Motley green spotted stones with but a thin coating of enamel, sometimes cracked and showing the brown inside core, will now be purchased by the Arabs. Defective flat gems are utilized by inscribing upon them words or mottos in gold in such a way as to hide the imperfections. Every species of stone finds a sale. The smallest being used in ornamental brass work and for decorating pipes.

Good stones could probably still be discovered, if systematic mining were carried on. The soil seems to be full of turquois in different stages of development from a cream colored chalky substance, which is said to possess medicinal qualities and is eaten by the natives, through intermediate forms of hard chalk to the variously shaded green and blue gems. The approach to the mines is literally strewn with fragments of the stones, and the walls and ceilings of the galleries are seamed with turquois composition, but being of bad color and full of flaws it is valueless. Some stones may seem to be of good quality, but they soon fade or white spots appear. These spots can be seen, at first, only with a glass. In time they increase in size and finally spread across the stone.

If a faded turquois be dampened its color is temporarily restored. The natives utilize this quality by carrying a stone in their mouths and deftly slipping it into their hands to display it. Dealers in Meshed guard against such deceptions by retaining a stone a few days before purchasing as the turquois is the most treacherous of jewels.

High prices are now paid for stones in Meshed. Indeed, good gems can be bought more cheaply at Tiflis or Constantinople. Some few years ago five turquois of cerulean blue, perfect shape, good size and flawless, could be bought for a dollar or so in Meshed, but, at present, as soon as cut they are exported direct to Moscow to supply Russian nobles or are sold to wealthy Persians. Those sold at Teheran by pilgrims returning from Meshed are of very ordinary quality.

H. L. Geissel.

Arizona's Petrified Forest to be Protected.

The chairman of the House Committee on Public Lands, Mr. Lacey, of Iowa, is advocating the project of setting aside a certain tract of land in Arizona as a petrified forest national park. This forest is one of the greatest natural curiosities on the American continent, and if properly cared for it will almost rival in interest the wonders of the Yellowstone, the Yosemite and the Mount Rainier Reservations. The petrified park lies a short distance from the Grand Canyon of the Colorado in Apache County. The trees probably grew beside some inland sea. After falling the cell structure of the wood in the tree was entirely replaced by silica. One of the most remarkable features of the park is a natural bridge 45 feet in width which spans the canyon; nearly 50 feet of the tree lies on one side so it is visible for nearly 100 feet. The wood is very handsome when polished.

Science Notes.

By this time Lieut. Peary has probably left his winter quarters and started on his trip to the Pole.

In restoring the White House recently while the workmen were painting the doors they discovered that they were of solid mahogany, but owing to some mistake the original wood had been painted in imitation of walnut. The paint was at once scraped off and the doors restored to their pristine state.

Prof. Dewar found by using a rhodium-platinum resistance thermometer, and by the use of methods designed to overcome the difficulties arising from the presence of air in the hydrogen, that the boiling point was 246° C. A constant volume hydrogen thermometer working under diminished pressure gave 252° C. The pure platinum resistance thermometer gave 238° C.

A bill passed by the New Jersey Legislature on March 20, authorizes the appointment by the Governor of a committee of ten persons to be known as the Commissioners of the Palisades. These Commissioners shall have power to condemn lands and take all other steps necessary for the preservation of the tall cliffs, and the subsequent conversion of the lands into a park in conjunction with the authorities of New York State.

Crude petroleum is said to be a remedy which will destroy and prevent the germination of the San Jose scale. It is said that it not only destroys this pernicious insect, but it also stimulates the growth of the tree to which it is applied. It is thought, however, by the best authorities that the scale can only be eradicated by destroying the tree infested with the bug and petroleum baths are apt to be fatal to trees.

P. Bourcet has experimented with certain edible plants with the object of determining how they absorb the iodine they require, and he publishes a table which shows that under identical conditions of soil, moisture and exposure, some plants absorb much more iodine than others, while some do not absorb a trace. The Liliaceæ and Chenopodiacæ were found to accumulate much more iodine than the Solanaceæ or the Umbelliferæ. In the case of the Compositæ and Cruciferæ the absorption of iodine varies in different species.

A German physician states that the wearing of veils is the cause of acne rosacea effecting the nose and he relates a number of instances in which young women, who were otherwise in excellent health, had their complexions impaired by wearing veils when riding, cycling, etc. He considers that the lesion is caused by the friction of the skin against the veil, impregnated with moisture from the breath, the effect being exaggerated by the tightness with which it is necessary to attach the veil when indulging in athletic pursuits. If veils must be worn while taking exercise, they should be loose, and the nose should be annointed with lanoline or some other suitable lubricant.

The investigations which have been carried on by the Connecticut Agricultural Experiment Stations on food adulteration shows that samples of ground coffee show a decrease in adulteration during the last four years, from 89 per cent to about 19 per cent. Fifty-six out of ninety-two samples of soda water sirups were found adulterated. The fruit juices, all samples, five in number, were adulterated, and the bottled sirups fifteen out of twenty-three samples were adulterated. Out of the ninety samples of bottled carbonated drinks, thirty-three were adulterated. The chief agents were boracic and salicylic acids and coal-tar dyes. In the sirup of a single glass of soda water was found enough dye to color brilliantly a piece of white woolen cloth, 6 inches square. The artificial extracts used in coloring are often of a nature to produce indigestion. Oysters and milk were also found to be kept by the aid of preservatives. The worst feature of the matter is that these foods are often prescribed for people who have feeble digestions.

Dr. A. MacFadyen finds that bacteria may be kept at a temperature of —190 C. for twenty hours without their vital powers being affected. The organism with which he experimented possessed varying degress of resistance to external agents—the extremes being represented by the very sensitive spirillum of cholera asiatica, and the highly resistant spores of the anthrax bacillus. Pure cultures were taken of bacillus typhosus, B. coli communis, B. diphtheria, S. cholera asiaticæ, B. proteus vulgaris, B. acidi lactici, B. anthracis (sporing culture), staphylococcus pyogenes aureus, B. phosphorescens, and photobacterium balticum. They were simultaneously exposed to the temperature of liquid air (—182° C. to —190° C.) for twenty hours, then carefully thawed and examined. In no instance could any impairment of vitality be detected, the fresh growth obtained being normal in every respect, and the functional activities of the bacteria quite unaffected. Experiments with representative types of organisms usually met with in the air—molds, bacilli, cocci, torulæ, and sarcinæ—had similar results, while a sample of yeast cell plasma (Buchner's zymase) retained its peculiar properties unchanged as regards the production of carbon dioxide and alcohol, after twenty hours' exposure to the intense cold mentioned. —Lancet.

Engineering Notes.

The rails on the railroads of India have been gradually increased in weight. Those used on the Indian Southern Railway now weigh 75 pounds; those of the East Indian Railway, 85 pounds; the length of the rails has been increased from 24 to 30 feet, and on one railroad 40 feet.

The Chicago Midlothian Club, of Chicago, is to build a railroad from the terminus of the street car tracks in Blue Island to the Midlothian clubhouse, a distance of five miles. Gasoline will probably be used to propel the cars. This is probably the first railroad built for the use of those interested in golf.

The annual report of the Boston Transit Commission was issued January 25 and gives some interesting comparisons. In 1897 the utmost capacity of the surface tracks in Tremont Street was 200 cars each way, per hour, and the rate of progress was sometimes as low as 2 miles per hour. In October, 1898, the subway, during the hours of the heaviest traffic, transmitted 282 cars each way per hour, the speed including stops being seven to eight miles per hour. It is estimated that the subway can carry 50,000,000 passengers per year.

Experiments were some time ago carried out by MM. Barthelot and le Chatelier to ascertain the velocity of detonation of acetylene, says The Engineer. The gas was exploded in horizontal glass tubes about 1 m. long and of 2 mm. to 6 mm. in diameter, and was operated with at various pressures between 5 and 30 kilo. per sq. cm. The velocity was registered by a falling photographic apparatus, released at the moment of detonation. The image of the horizontally-moving flame in the tube, combined with this vertical movement, gave a curve on the photograph, from which at any point the velocity could be found. The results indicate that the velocity depends upon the initial pressure of the gas, from about 1,000 m. per second at 5 kilos per sq. cm. to 1,600 m. at 30 kilos.

With the object, says The Globe, of encouraging emigration to the fertile regions recently opened up by the Trans-Siberian Railway, the Russian government have given orders for the issue of tickets at a very cheap rate. These special tickets will be issued for Tobolsk, Irkutsk, and, beyond there, for Vladivostock and Port Arthur. One ticket, apparently, will cover a whole family, and will be available at something like 114 stations on the line of route. The zone tariff has been adopted. From any point in Russian Europe to Tobolsk the price per head has been fixed at two roubles. Beyond Tobolsk to any spot in the vast Siberian region the charge for these emigrant tickets will be 4½ roubles a head—that is to say, that for about $3.62, one will be able to travel a distance of over 6,000 kiloms., or something like 4,000 miles.

A historical collection relating to the subject of transportation, vehicles, etc., is to be established in the Civil Engineering Palace of the Paris Exposition, which promises to be of considerable interest, as the principal railroad companies have announced their intention of contributing objects of interest relating to this subject. The collection will contain a number of diligences and other vehicles, such as have been used in France in past years, and also various types of velocipedes, and other objects which concern the history of travel or locomotion. The committee in charge of the matter has issued an appeal to all persons who are in possession of interesting objects, drawings, engravings, medals, articles of voyage, etc., asking their co-operation in making up this collection. All articles sent will be guaranteed from risk by the Administration of the Exposition. Communications upon this subject may be addressed to M. Duchemin, 12 Rue de Hambourg, Paris.

The Italian Navy has recently added a new torpedo cruiser, called the "Agordat;" it was launched on the 12th of last October. This boat has a length of 87 meters and a maximum width of 9·3 meters. The average draught is 3·2 meters and the displacement 1,350 tons. The protection of the "Agordat" is assured by an armored deck inclined on all sides and extending the whole length of the boat. This deck has in the central part an armor of 10 millimeters, which is doubled on the sides, over a length equal to about half the boat. The protection is completed by the coal bunkers, which contains about 160 tons; these are placed forward and arranged above and below the armored deck. The engines are designed to give 8,000 horse power normally, at a speed of 23 knots per hour; of these there are two of the triple expansion type with four cylinders. Water tube boilers of the Bleckynden type are used; these having four fire-places. These boilers ars placed in two compartments, situated forward and aft of the engine room. The armament consists of 12 cannon of 76 millimeters; two of these are placed forward and two aft, with a range of 150° from the keel-line. Six of the guns are placed on the sides, with a range of 120°, and the remaining two under the forecastle, with 150° range. The vessel is provided with two torpedo tubes placed on deck in the center of the boat.

Electrical Notes.

The peculiar value of electrical power for the operation of the mountain railroads is now becoming recognized. It is probable that soon the trolley system will be the only one used for mountain climbing, thus effecting the saving of the weight of locomotives, water and fuel. The overhead trolley has been adopted for the Jungfrau, and a similar system will be used on the projected rack railway between Chamounix and the Montanvert.

The St. Louis and Suburban Railway Company have advanced the salaries of all their employees 10 per cent for the two weeks of February on account of the hardships entailed by bad weather, and the good work which they did. The St. Louis Transport Company has also granted its employees extra pay for work done in February. Each employee received 75 cents for work on the night of the storm of February 28 says The Street Railway Journal.

The relative actinic intensities of the three parts of the electric arc—viz, (a) a green tinted aureole, b (a) darker mantle of flame, and (c) a bright blue-violet nucleus—depend greatly upon the kind of carbons used. Experiments have been carried out by Herr E. W. L. Richter in which a Nicol's prism photometer is employed for comparing the apparent relative intensities, using in some cases carbons with a known percentage of a salt, such as sodic chloride. In one case mentioned, using solid carbons 13 mm. diameter with an arc length 15 amperes, and 56 volts, the ratios are $b : a : c = 1 : 2{\cdot}28 : 3{\cdot}32$.

Single tracks are largely used in India and South America and in India the large wheel is used at the end of the outrigger, and the load is so distributed that the weight is chiefly carried by the rail-wheels, but are slightly overbalanced on the side of the road-wheel. A Scotch firm has recently devised a single rail truck for use in India. It has two rail wheels, which run on the same rail, and is driven by independent chain gear from the motor spindle. An accumulator is under the platform. The truck is intended to carry a load of five hundredweight and in addition to draw two trucks each carrying one ton at a speed of eight miles an hour.

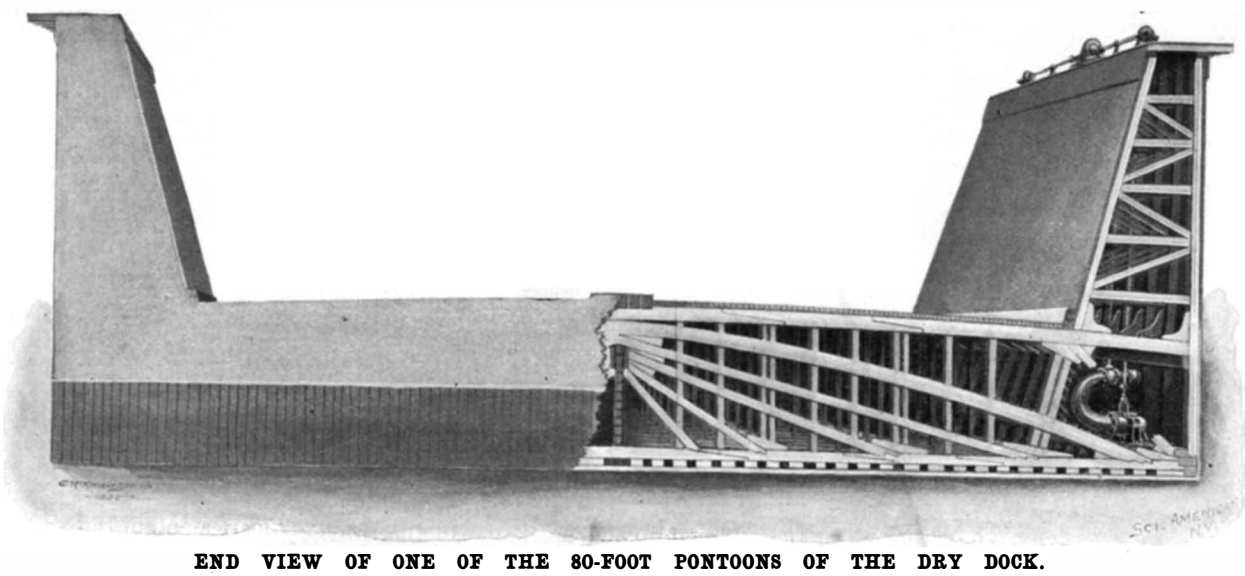
The Soulanges Canal was officially opened by the Canadian government a short time ago. The canal has been under construction for seven years and cost $5,250,000. The power house is situated 5 miles from the upper end of the canal. Hydraulic power is used in generating electricity, and a working head of 20 feet can be obtained from the canal, five hundred electrical horse power can be developed, says The Electrical World, and the power is used for operating the locking gate machinery, sluice valves and road bridges, of which latter there are seven which swing on a pivot set in the side of the canal instead of midstream as is customary, and also for the general lighting of the canal. Arc lights of 2,000 candle power are placed along the north bank at intervals of 480 feet.

The cheap fence telephone system for farmers, recently described in the SCIENTIFIC AMERICAN has been in use in Texas for a long time. At Midland, on the southeastern foot of the great "Staked Plain," a large number of outlying cattle ranches are connected with the city telephone system in this manner. Some of the lines are 25 to 50 miles in length and according to another correspondent, are even 100 miles long. The distance owing to the angles is usually twice the air line length. During ordinary weather they render perfect service, in damp weather they work rather poorly, owing to lack of insulation. The practicability of this plan has been known in that section for seven or eight years. Our correspondent is probably correct in saying it had its origin in Australia. We gave an account of this interesting telephone system as used in Australia several years ago.

The International Traction Congress, which is to be held in connection with the Paris Exposition, promises to be of unusual interest and importance, especially in view of the development of electric roads, which will form an important part of the programme. The Congress is to be held under the general direction of the International Traction Union. The committee includes a number of prominent men in this branch, the president being M. Leon Janssen, Director of the Traction System of Brussels, and the members include a number of directors of different systems in France, Germany, Austria, England, etc. America is represented by Mr. J. M. Roach, President of the American Traction Association. A detailed list of the general topics and the questions relating to each, has recently been published; the following is a general outline of the points to be considered. Consequences of the application of electric traction; advantage and disadvantage of standard or narrow gage with reference to electric roads; arrangement of central stations; systems of current distribution; discussion of the Polk railway joint; accumulators, car-heating, branch roads, questions relating to electric motors and generators. The secretary, M. Nonnenberg, may be addressed at 85 Rue Potagère, Brussels.

700-FOOT FLOATING DOCK AT SOUTH BROOKLYN.

The port of New York has hitherto been severely handicapped by the lack of proper dry dock facilities for vessels of the larger class. It is well known that the fleet of mail steamers which plies between the old and the new world includes the very largest vessels afloat; and while they start and arrive at a great many different ports in the old world, practically the whole of the fleet makes New York its destination on this side of the Atlantic. Whenever disaster has overtaken one of these big ships on its westward passage it has been necessary for it to go to some other port than New York for dry-dock repairs. It is satisfactory to know, however, that all this is being changed by the construction of a large floating dry dock which will be located conveniently to the new 40-foot channel which is being dredged along the Brooklyn foreshore. This dock, which is to have an extreme length of 700 feet, will be capable of accommodating the largest vessel afloat, and one of our illustrations on the front page shows the "Oceanic," which has an over-all length of 704 feet, comfortably accommodated in the big structure.



END VIEW OF ONE OF THE 80-FOOT PONTOONS OF THE DRY DOCK.

The dry dock is merely one feature in an extensive and thoroughly up-to-date ship repair yard which is now being laid out and constructed by the Morse Dry Dock Company at South Brooklyn. The property is situated between Fifth-fifth and Fifty-eighth Streets, and backs on First Avenue, along which it extends for a distance of 426 feet. In addition to the floating dry docks there will be a wet dock or basin, the inner end of which will be about 100 yards from First Avenue, while the two piers which inclose it will extend out 1,400 feet to the edge of the new government 40-foot channel. The first 700 feet of the basin will be about 37 feet wide with a depth of 25 feet, and here vessels with a moderate draught of water will be berthed in the proximity of the machine shop. The outer 700 feet of the channel will be 100 feet wide and will have a clear depth of 35 feet, or sufficient to accommodate the largest ocean liners. The pier to the south will be 22 feet in width, and that to the north 30 feet in width. On the north side of the latter pier will be the dry-dock basin, which will have a clear width of 130 feet and a depth of water at the entrance of 35 feet, while the length of this basin will be just 1,000 feet. The pier on the north side of this basin will also be 30 feet in width. The frontage of all three piers will aggregate 4,000 feet and each pier will be traversed by a railroad which will run through the repair and boiler shops, and also have connection with other points in the yard. At about the mid-length of the southerly pier there will be a large coal pocket for the accommodation of the ships which visit the basin. Immediately to the east of the dry-dock basin will be a boiler shop, and beyond this a large two-story machine and repair shop, the width of each of these buildings being 80 feet, and their combined length 600 feet.

The object of most popular interest is naturally the large pontoon dry dock. This huge structure is not built, as might be supposed, as one integral structure, continuous throughout, but is composed of seven separate sections, which are identical in every respect. Each section is built of an approximate U-form. The body of the pontoon is 120 feet wide, with a maximum depth of 15½ feet at the center. On each side are two tall wings, each measuring 56 feet from the bottom of the pontoon to the top platform, on which are located the motors for operating the electric pumps and hand-wheels for opening and closing the inlet valves. Each section is 80 feet in length, and, as there is a 36-foot extension of the floor of the two end sections, and a space of about 4 feet is allowed between the adjoining sections, it will be seen that the total over-all length of the dock is approximately 700 feet. The illustration showing an end view of one of the pontoons is self-explanatory. The dock is built of the best Southern pine, and a very complete system of stiffening bulkheads is used, there being seven running longitudinally, or fore and aft through each pontoon.

Each section is provided with a number of inlet gates below the water line, and it carries sufficient ballast to insure its sinking when the gates are opened. On the floor of each wing are located two centrifugal pumps, each pair driven by a 50-horse power electrical motor, which is located on the working platform above. These pumps have a capacity of between 5,000 and 6,000 gallons of water per minute, and it is expected that they will be capable of lifting a ship in from 30 to 45 minutes. The lifting capacity of each pontoon is 2,500 tons; consequently, the combined lifting capacity of the whole dock, when coupled up, will be 17,500 tons.

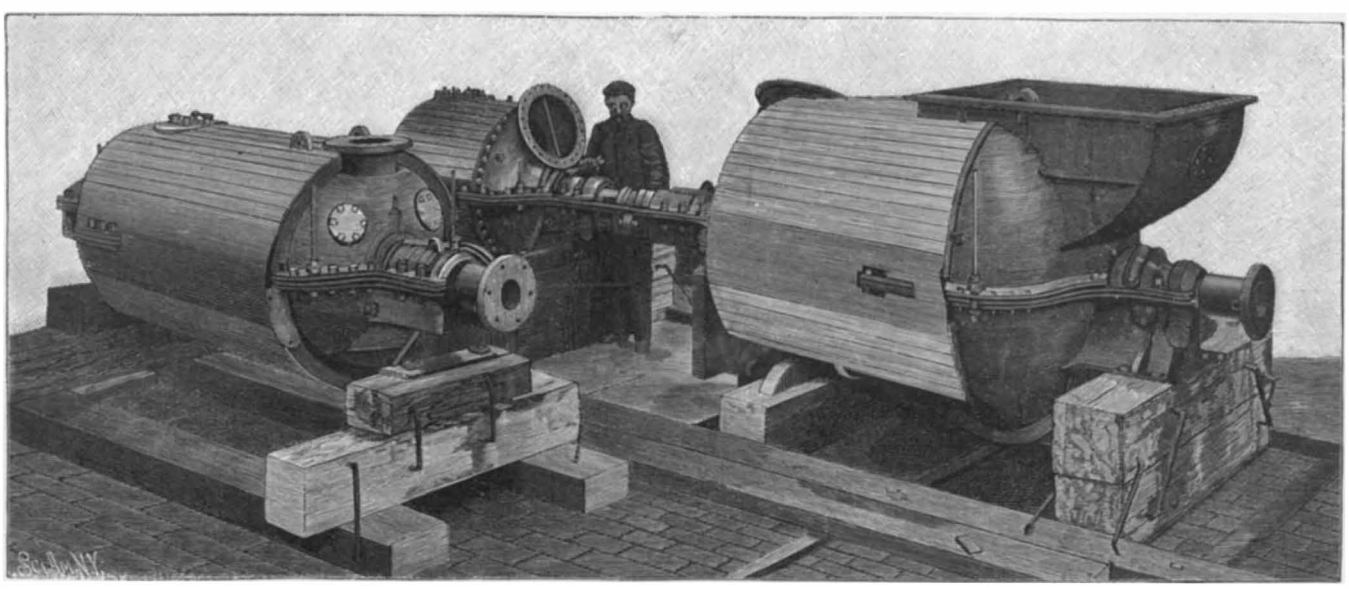
In docking a ship like the "Oceanic," the inlet gates will be opened and the pontoon sunk to a depth which will allow the big vessel to be backed in between the wings, with the necessary clearance between her keel and the keel blocks. As soon as everything is in position, the fourteen electrical pumps on the upper platforms will be started simultaneously from a controlling switchboard, which is located at the inner end of the dry-dock basin. As the water is pumped out the pontoons will rise, lifting the vessel until she is clear of the water, as shown in our front-page illustration. The bulk of the weight, of course, will rest upon the keel blocks, and it is interesting to note in our detailed view of the pontoon how this enormous concentration of load is distributed across the full length of the floor by means of massive 10×10 timber struts, which radiate from the top of the center-line bulkhead to the foot of the immediate bulkheads on either side. The timbers or "shores" which are shown reaching from the side of the vessel to the inner wall of the wings do not, of course, carry the load, but merely keep the ship on an even keel. One advantage of the pontoon method of building these docks is that only so much of the dock need be used as is desired. A vessel that was only 150 feet long would simply require the pumping out of the first two sections. The wet dock, as the adjoining basin is called, will be used simply for the reception of such vessels as needs repairs, but do not require docking. For the conveyance of material between the shops and the vessels under repair there will be two locomotive cranes and several freight cars. The cranes will be capable of lifting machinery and other heavy weights from the ships and carrying them to whatever part of the yard is desired, or vice versa.

The repair buildings will contain the blacksmith shop, boiler shop, machine shop, and various other departments required in a modern plant of this kind. The machinery will be in every way up to date. Electric power will be extensively employed, most of the machines being run by direct-connected motors, and extensive use will be made of compressed air, not only in the shop, but throughout the yard. For the latter service lines of compressed air mains will be carried down the full length of each pier, with valves at every 75 feet, to which flexible hose can be attached for work upon the ships themselves. This compressed air will be used for caulking, riveting, chipping, drilling, and the other operations incidental to ship repairs. The company estimates that it will be able to accommodate about twenty-five ships, big and little, at one time in the dry-dock and the adjoining basins.

It will interest our readers to know that the dry-dock basin was given an extreme length of 1,000 feet, or over 300 feet more than the present length of the dry dock, in order to allow for the addition of three or four more pontoons if they should be rendered necessary by the future increase in the length of ocean steamers. The company anticipates that in view of the proved advantages of size, it will not be many years before a vessel of 1,000 feet length will enter the port of New York.

THE ENGINES OF THE TORPEDO BOAT DESTROYER "VIPER."

The torpedo boat destroyer "Viper" is one of a large number of vessels of the destroyer type built for the British Navy, which are identical in everything except the engines. In all but one of these vessels the engines are of the standard, reciprocating type, but the "Viper," was equipped with Parsons' turbines of the kind which won much distinction in the world-renowned experimental vessel "Turbinia." The figures given in the official tables of the British torpedo fleet show that the "Viper" was to make 31 knots with 6,500 horse power, and 35 knots with 10,000 horse power. The principle dimensions of the boat are as follows: length 210 feet, beam 21 feet, draught 7 feet, molded depth 12 feet 9 inches, and displacement 350 tons. On her recent official trial the "Viper" attained a speed of 35½ knots with 11,000 indicated horse power. The engines of the reciprocating type indicate about 9,000 horse power when driving a destroyer of about the same size as the "Viper" at 32 knots an hour. Although speeds of 32 to 35 knots an hour are reputed to have been obtained by the torpedo boats with reciprocating engines built for the Chinese government by Schichau, of Elbing, Germany, these craft are so much smaller that no satisfactory comparison of horse-power developed for a given speed can be made between these vessels and the turbine-propelled destroyer.



THE STEAM TURBINES OF THE 35½-KNOT DESTROYER "VIPER." MAXIMUM INDICATED HORSE POWER, 11,000.

The "Viper" was constructed by the Parsons Marine Steam Turbine Company, of Wallsend-on-Tyne, the turbines being built at the same works. The power is developed on four shafts, two on each side of the center-line of the vessel. The engines are in duplicate and consist of two distinct sets, one being placed on each side of the center-line of the vessel. Of the four propeller shafts, which are quite independent of one another, the two inner shafts are driven by the two low-pressure turbines, and upon each of these shafts is also coupled a small reversing turbine which revolves idly with the shaft when the vessel is going ahead. When the vessel is going astern, steam is shut off from the main engines and fed to these reversing turbines, which have sufficient power to drive the vessel astern at a speed of 15 knots an hour. The high-pressure cylinders of the two engines are placed upon the two outside shafts. Each of the four shafts is provided with two propellers,

the forward propeller in each case having a slightly less pitch than the after propeller.

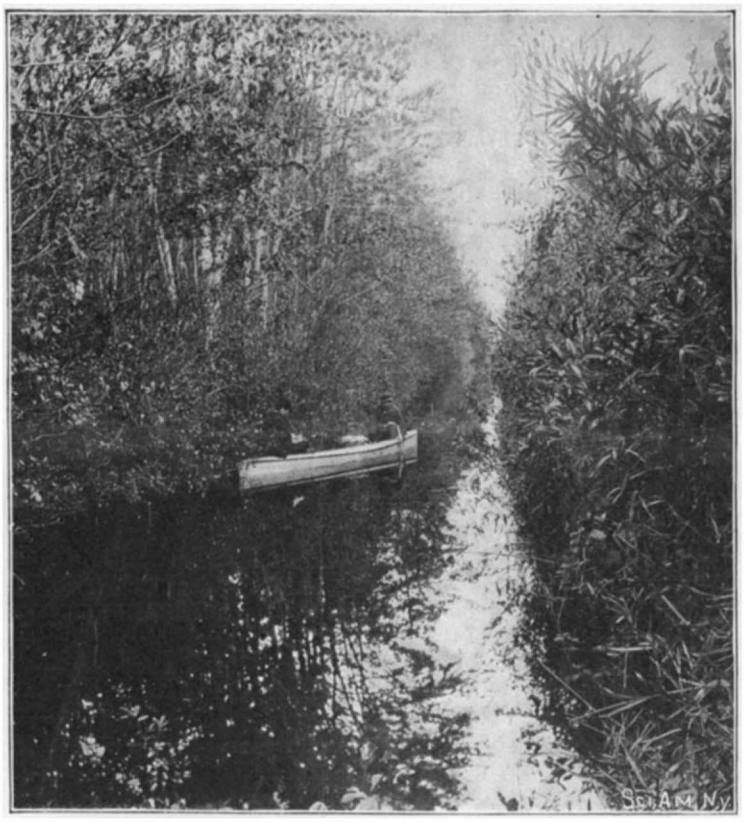
In the accompanying illustration, which represents one of the complete sets of engines, the low-pressure and reversing turbines are shown coupled upon one shaft, and the high-pressure turbine upon the other. One valuable feature of this system of propulsion is that the thrust of the propellers is entirely balanced by the pressure of the steam upon the turbines, so that there is no necessity for the usual thrust-block bearing, and the large amount of friction due to the thrust block is thus avoided.

The total weight of the engines, with their auxiliary gear and the water in the condensers, is about 60 tons, which works out at about 183 horse power to the ton when the engines are working up to their maximum power. This remarkably good showing is offset, however, by the greater weights in the boiler rooms which are necessary to meet the demands for the necessary large supply of steam. The turbines proper, with their foundations, are of course extremely light for the horsepower developed when compared with engines and their foundations of the reciprocating type. The increased size of the auxiliary machinery and the condensers due to the larger boilers serves to bring the total engine and boiler room weights nearer than would be expected to those necessary for engines of standard design. Undoubtedly the greatest advantage of the turbine-propelled torpedo boat is the remarkable steadiness due to the absence of reciprocating parts. Reports of the trial state that when the vessel was making a speed of over 40 land miles per hour there was an absolute absence of vibration. This is an important feature, both in respect of the steady gun-platform which is thus provided and of the increased comfort of the officers and crew. The latter consideration is one, the importance of which can only be understood by those who have to endure the very real hardships of torpedo-boat service.

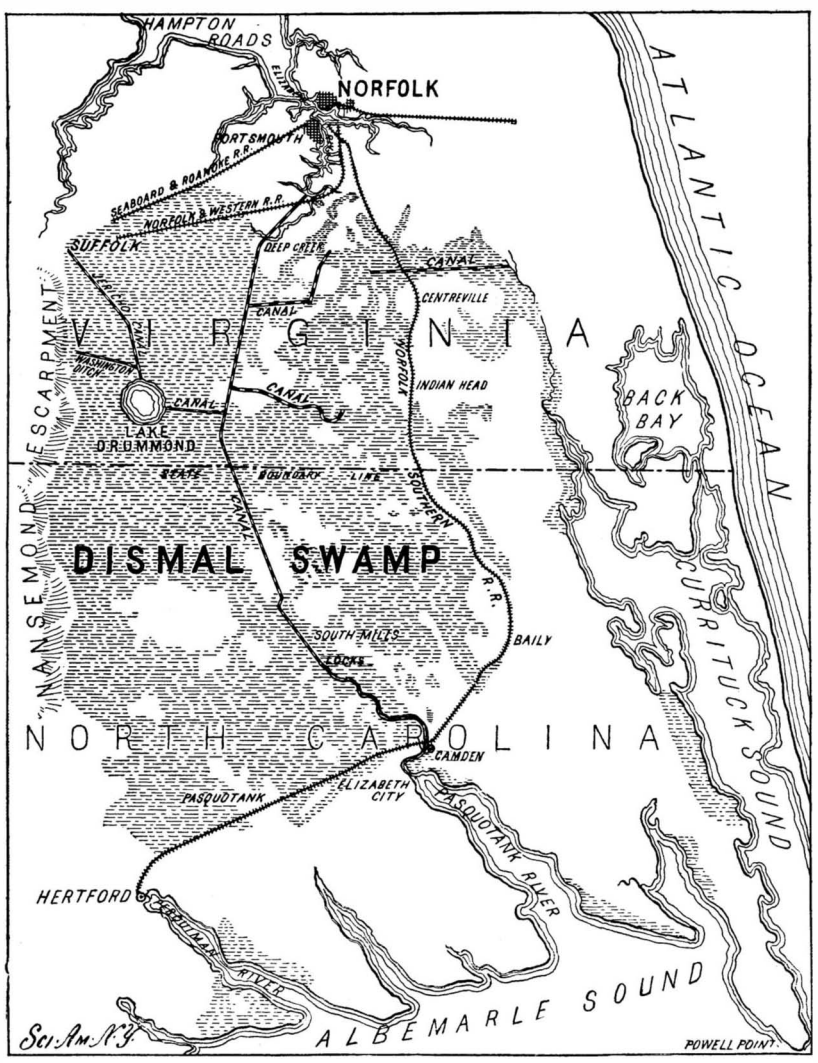
The Finding of the South Magnetic Pole.

The steamer "Southern Cross," with C. E. Borchgrevink and the survivors of the South Polar expedition, which was fitted out in 1898 by Sir George Newnes, has arrived at Wellington, New Zealand. Herr Borchgrevink reports that the magnetic pole has been located. "The key to the future knowledge of terrestrial magnetism lies in the determination of the exact position of the southern magnetic pole," remarked Sir Joseph Hooker, several years ago. The work of Sir James Ross, who, early in 1841, sought a harbor in Victoria Land with a view to spending the winter there and planting his flag on the south magnetic pole the next summer, will be remembered. He did not, however, succeed in reaching it, and the nearest he came to it was off Mount Erebus. Sir John Ross discovered the position of the North Pole some sixty-seven years ago, and the knowledge of the exact position of the north and south magnetic poles will set at rest the question which is still much in dispute among scientific men, as to whether their position is fixed or variable, and if these poles are not stationary the comparison of their position at various times will show the direction and rate of their motion, which will enable the scientists who are interested in terrestrial magnetism to find the law governing the changes in magnetic declination, inclination and intensity. Accounts which have come to hand at present are very meager, but if the expedition has done nothing more than discover the south magnetic pole, it has many times paid for itself from a scientific point of view.

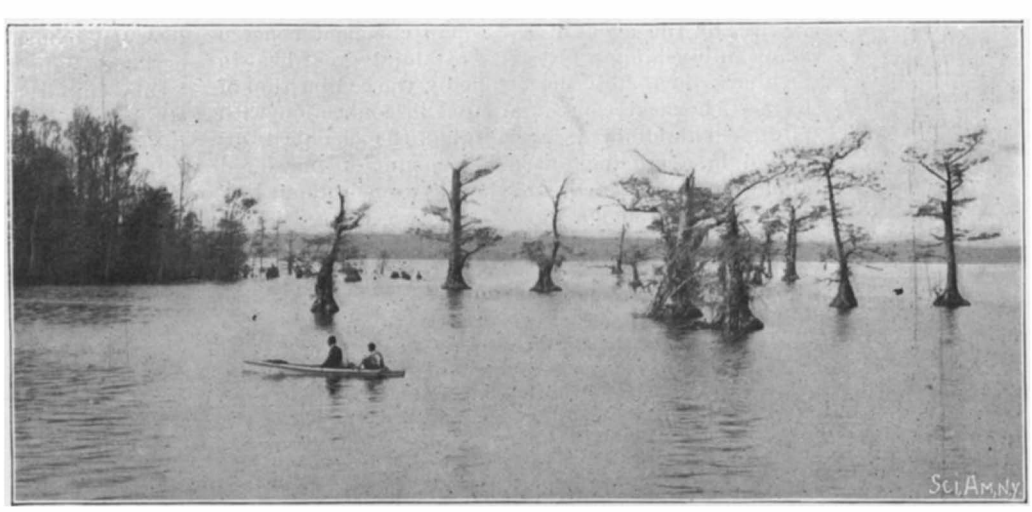
WITH the completion of the extension of the Dresden tramways now in hand there will be about 70 miles of line worked by electricity. A new generating station is being erected at a cost of $1,300,000. In the new station there will be installed five steam sets of 1,000 horse power each, while a further addition of two such sets will be made to the original plant, together with the additional boiler power rendered necessary. The tramways at Dresden, says The English Electrical Engineer, are in the hands of two distinct companies, which purchase the necessary current for working their lines from the corporation, the method of charging being an interesting one.



JERICHO DITCH, GREAT DISMAL SWAMP, VIRGINIA.



THE DISMAL SWAMP CANAL.



LAKE DRUMMOND, GREAT DISMAL SWAMP, SHOWING THE LIVING TREES PROJECTING ABOVE THE WATER.

THE DISMAL SWAMP OF VIRGINIA.

The Dismal Swamp of Virginia and North Carolina is one of the most curious features of the North American continent, and it is one of the least known sections of the country. It is a great fresh water morass lying back from the sea, between Norfolk and Albemarle Sound. It belongs to that group of innundated lands where the lack of drainage is due to an original deficiency of slope combined with the retarding influence of vegetation on the movement of the water from the land. The coast from New York southwest has the form of an ancient sea-bottom, more or less modified by river action. From the James River southwest the elevations of the plain are still further lowered, the incisive action of the streams have yet further reduced it, leaving parts of the surface in the form originally belonging to the sea bottom. This plain is sharply bounded to the west by an escarpment formed by the sea when the surface of the continent was about 28 feet below its present level. This old sea-bench, to which Dr. Shaler, in his interesting account of fresh water morasses in the United States, published in the Tenth Annual Report of the Geological Survey, gives the name of the "Nasemond Shore Line," extends from near Suffolk, Va., where it is rather obscurely indicated, having been somewhat effaced by erosion, southward, with extreme distinctness of the front to Albemarle Sound. The eastern boundary of the swamp district is determined by certain low elevations, apparently dune-like in their nature. In its original condition before its origin had been effected by tillage, the area was considerably greater than it is at the present time. The processes of artificial drainage, of course, resulted in the reclamation of a large area, and the upper portion of this geological drainage work was finished before the middle of the present century. In the last century the Dismal Swamp Canal Company constructed a canal in a general western and southern direction from the waters of the James River to the waters of the Albemarle Sound near South Mills, N. C., and in the SCIENTIFIC AMERICAN for March 5, 1898, will be found a description of the recent increase in the size of this canal. The result of this interference with the natural drainage of the swamp has been that the western section of the morass is probably more flooded than it was before the barrier was constructed, while the section to the east of the canal, deprived of water which originally flowed into it, has become partially dessicated.

Probably the most interesting feature in the typography of the Dismal Swamp is the presence of a large lake, toward the western end of the swamp. Its origin has not been definitely determined by physical geographers. Dr. Shaler is of the opinion that it was formed in the following way: The generally sloping platform on which the Dismal Swamp rests, evidently emerged from the sea in a somewhat rapid manner. The absence of any marine bench on its surface appears to be conclusive evidence of this.

First, we may assume that the sterile character of the soil would have prevented the growth of forest trees and other plants of a higher order over the greater part of the plain. The growth of such plants would naturally have begun on the periphery of the district, either on the western border, where the soil had already been formed, or next to the sea, where the humidity would favor the growth of plants, even on barren sand. The forest then probably advanced toward the center of the field and the falling trees and other entanglements would serve to form an obstruction to the outflow of water, and thus to retain the central part or area in the condition of a shallow lake. The area of this basin will be gradually narrowed by the growth of cypresses, black gum, and other trees which can maintain their roots below the level of permanent water. The level of the water in Lake Drummond has been raised until since the construction of the canal and the forest is still gaining upon the lake at several points.

If Dr. Shaler's views are accepted, Lake Drummond must be considered as belonging to the type of enclosed lakes, which are so common in the small morasses of glaciated areas. The vegetation exhibits a great diversity over the

entire area of the swamp, which is estimated at between 800 and 1,000 square miles. The principal trees are those which are tolerant of water about their roots. These are the bald cypress, juniper and black gum. There are also canes and mosses in great variety.

The reputation of Dismal Swamp is that of a gloomy and impenetrable region, filled with fever and malaria, and infested with snakes and noxious animals.

John Boyle O'Reilly, who spent some time in exploring the swamp, says: "The Dismal Swamp is an agony of perverted nature. It is Andromeda, not waiting for the monster, but already in its grasp, broken and silent under the intolerable embrace."

The lake was discovered in 1775, by a Scotchman named Drummond, and after the Revolution, George Washington purchased the swamp and organized the Dismal Swamp Company, which still exists. It was Washington's idea to reclaim the swamp, and for this reason he cut the canal described herein.

There are a large number of species of animal life in the swamp, bears being abundant. Deer are now rare, but are still occasionally shot, and wild horned cattle are found within the limits of the swamp. These cattle feed upon the tenderer shoots of the canes, and dwell in considerable herds. Bird life is abundant, and the number of serpents is extraordinary at certain seasons of the year. Various ditches have been dug for draining the canal, and at present access is obtained to Lake Drummond by Jericho Ditch, 12 miles long, 15 feet wide and 3 feet deep. The first section of the swamp is comparatively open, having been burnt off. Gradually the cane brake becomes thicker and the reedy growth resembles bamboo or papyrus, the banks of the ditch are for the most part very marshy; the growth of young canes, holly and mistletoe is notable. The water is of a deep sherry color, and, strange to say, it is said to be healthy to drink, probably owing to the infusion of juniper. The "Black Gum Swamp," two miles from Lake Drummond, is most impressive, the trees being tall and set close together.

Paris Exposition Notes.

Those who are familiar with Exposition work state that the Paris Exposition will not be in full working order until June 15, although it will probably be sufficiently advanced one month from the opening, namely, May 14, to satisfy visitors.

Arrangements, for admission to the Paris Exposition have now been made. Tickets will cost one franc each, and may be purchased in many places all over Paris. Between the hours of eight and ten in the morning two tickets will be required for admission, and from ten to six one ticket only will be required, but after six o'clock two tickets must be presented. When there are spectacles or exceptional attractions three to five tickets will be required.

The American Section will, so far as possible, be closed on Sunday. Considerable effort was required to obtain this concession. A by-law compels the opening of all the exhibits on the seven days of the week, and even gives the French authorities power to remove the coverings over the exhibits. The same rule applies to machinery. The Director-General of the Exposition has, however, given special permission to close the American Pavilion on Sunday.

There is an evidence of a great advance in prices during the Exposition, both in hotels and pensions. First-class accommodations within a reasonable distance from the Exposition are going to be very expensive. An ordinary boarding house which usually charges seven francs a day has now made arrangements to charge thirty francs. Those who are to spend some weeks at the Exposition will do much better by living a short distance outside of Paris. The railroad communications are excellent and trains will be run directly to the entrances. In fact, it is a question if it will not be more comfortable to live in this way than to use the crowded means of communication in the city proper. The scarcity of cabs and carriages will be very great and the omnibus and tramways are allowed to carry only a certain designated number of passengers.

The regulations under which photographers may pursue their pastime within the precincts of the Exposition have, at last, been formulated. The use of hand cameras will be permitted at all times, free of charge or restriction, but the use of apparatus standing on a tripod will be allowed only up to one o'clock. In addition, photographers of this class must obtain written permission from the Commissioner General and pay the tax, which has been fixed at five francs for one day or two hundred for the period of the Exposition. No exhibit may be photographed without the written authorization of the exhibitor and the interested persons must also obtain from the foreign Commissioner-General or Concessionaries, authorization to reproduce their palaces or pavilions. They assume all responsibility for reproductions they may make and guarantee the Administrator of the Exhibition against all claims. These rules are certainly wise and liberal and are in a marked distinction to the unfortunate conditions of affairs at our own Exhibition in 1893.

Solidification of Hydrogen Gas.

A year ago Prof. Dewar liquefied hydrogen; he has now gone a step further and produced hydrogen as a solid. In an interesting series of experiments made before an audience at the Royal Institution on April 6, he showed how the gas could be solidified. He surrounded the tube containing it with liquid air to prevent the increase of heat and then applying a powerful air pump to the liquid hydrogen he transformed it into a white opaque solid. The New York Sun, which cabled over an account of the experiments, says that in discussing the question of the utility of solid hydrogen in scientific research, Prof. Dewar said that the mere fact that its transformation from gas is interesting because it is the elementary body of the lowest atomic weight. One of its uses was in the solidification of oxygen, and it could also be used in the separation of mixed gases.

THE NEW ASSISTANT COMMISSIONER OF PATENTS.

As we announced two weeks ago, Walter H. Chamberlin, Esq., of Chicago, was nominated as Assistant Commissioner of Patents to succeed Arthur W. Greeley, Esq., who resigned. There were many aspirants for the position, but the matter of a successor to Mr. Greeley was left to Commissioner Duell, the President considering that in view of the intimate relationship between the offices the head should be consulted. Mr. Chamberlin was well-known to Commissioner Duell, and he was satisfied of the latter's fitness for the position.

The new Assistant Commissioner was born February 9, 1866, at Detroit, Mich. He selected law as a profession and was taken into the office of the late Wells W. Leggett, a son of the former Commissioner of Patents, and a recognized attorney in the patent world. After graduating from the law course he was admitted to the

ASSISTANT COMMISSIONER OF PATENTS
WALTER H. CHAMBERLIN.

bar in Chicago in 1890 and at once began the practice of his profession. He continued in practice up to the present time, making patent law a specialty. He was endorsed for the position which he now holds by the leading patent lawyers of Chicago and elsewhere. Mr. Chamberlin favored the appointment of Mr. Duell as Commissioner of Patents in 1897, and both he and the Commissioner have been warm friends for some years, and the Commissioner considers that his new assistant will be very helpful to him for carrying out the policy which he had adopted. Mr. Chamberlin has already entered upon his new duties. We wish him every success in his new office.

Remarkable Metallurgical Experiments.

Some interesting experiments were carried on in the laboratory of Mr. T. A. Edison, at Orange, N. J., on April 7, by the agent of a German chemical concern who exhibited a new process of attaining great heat in an almost incredibly short time by the combustion of a secret chemical compound used in connection with powdered aluminium. A cupful of the chemical was placed in a crucible, a small amount of powdered aluminium was added, and then a wrench about half an inch thick and six inches long, was placed in the crucible. A match was touched to the compound and violent combustion took place. It is estimated that the temperature was not far from 3000° C. At first sight these statements seemed almost impossible, but Mr. Edison writes us, "The process works well."

The Rotation of Venus.

A telegram has been received at the Harvard College Observatory from Prof. Kreutz, at Kiel, stating that he has information from Prof. Backlund, Director of the Observatory at Pulkowa, Russia, that, from an examination of spectrograms, Belopolsky has found the time of rotation of Venus to be short.

Automobile News.

Steam omnibuses are used to a considerable extent in Algeria.

The Acting Secretary of the Treasury has ruled that an automobile is not free of duty as a personal effect, but is free of duty as a household effect if used abroad by the owner one year or more.

An interesting use of the motor carriage is in delivering newspapers in long, straggling country districts, where it has proved invaluable. Two of the London journals have tried the plan with great success.

Horseless carriages proved very successful in Boston, during the heavy snows of last winter, the only difficulty was after the snow began to melt, the drifts near the curb making it troublesome getting near to and away from the sidewalks.

The Automobile Club of America has issued a pamphlet of fifty-six pages in the interest of good road agitation. It contains a list of officers of the club and the various addresses delivered before that body. The pamphlet is almost entirely devoted to the improvement of the highways of the State of New York.

The Paris Exposition authorities have appropriated 100,000 francs toward the expense of the automobile section. This will be some 30,000 francs short of the estimated deficit. The Automobile Club of France has agreed to carry out the programme practically in its original form.

The principal factor of agitation in Tokio at present is street railways; applications have been sent in for permission to put down about 200 miles in all in the city. The system proposed is electrical. Whether the scheme will get beyond the regions of talk or not in the very near future is more than one can say. The proposed cost of installation is 15,000,000 yen. The French have shown a good deal of enterprise in trying to introduce French-made vehicles in Japan. About a year ago a Frenchman brought a motor street carriage to Tokio; after showing it off in the streets of the city for about a month or so, and finding no purchaser, he suddenly packed it up and took it back to France. This gentleman is now in Tokio again with a "Serpollet" street railway car, and has shown what can be done with it. The local papers speak well of the machine, but I expect nothing but electricity will find favor with the city authorities.

The new automobile service in the Soudan, between Kayes and Bammako, on the Niger, has been recently inaugurated, and a communication from Kayes, dated the third of February, states that Governor Chaudié had just returned from a voyage in which he had laid out certain new territory, and in the course of which he inaugurated the new automobile system for the transportation of passengers and merchandise between these two points. The governor and party left from Bammako on the 22d of January and arrived in two days at Kiti, making about 90 kilometers per day on a six hours' run. From this point he passed to Toukouto, and finally arrived at Kayes on the 27th of January, the whole trip taking thus about five days. Upon his arrival the governor expressed himself as greatly pleased with the rapidity and facility of the new system, and recalls the fact that on a former trip to the Niger it required fifteen days to cover the same route. By this system the Senegal is brought into connection with the Niger, the district passed through being one which had not been reached heretofore by water or by railroad, on account of the rapids of the Senegal and the mountainous mass called Fouta-Djalon, which separates the Senegal from the Niger. The automobiles for this system were constructed by a Paris firm, and were installed under the direction of M. Felix Dubois.

The Current Supplement.

The current Supplement, No. 1268, is opened by an article on the Pan-American Exposition, accompanied by engravings of a number of views in the grounds and also of the buildings. "Power Consumption and Comparative Costs of the Automobile Delivery Wagons," is by Prof. George F. Sever. "Educational Values," is by Prof. W. Le Conte Stevens. "One Hundred Years of Achievement of American Glass Manufacture," is by C. A. Tatum. "The Neolithic Epoch in Ancient Egypt," is an interesting and fully illustrated article. "Earthquake-Sounds," is by Charles Davison.

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RECENTLY PATENTED INVENTIONS.

Bicycle-Appliances.

BRAKE. — MARTIN FESLER, Salt Lake City, Utah. The brake is of the back-pedaling type, and comprises a flanged axle and a sleeve having a housing at one end, one wall of which is provided with curved slots. On the sleeve a hub is mounted having limited movement. In the housing are pivoted spring-pressed levers adapted to engage the flanges of the axle. Projections carried by the hub extend into the housing of the sleeve and engage the brake levers.

Electrical Apparatus.

MEDICAL GALVANIC BATTERY.—HARRY BENTZ, Manhattan, New York city. This battery, designed for medicinal purposes, comprises a number of sets of cells, all mounted on a single support. The cells of each set are connected in series. A circuit-closer controls a circuit through one or all of the sets of cells. Another circuit-controller closes the circuit through one or two of the sets of cells, independently of the other cells. The current strength can be easily changed or regulated. The electrodes can be placed upon any portion of the body or head.

ARC-LAMP.—EDWARD L. BOWEN, McComb City, Miss. The inventor has provided a simple, ingenious device for automatically regulating and controlling the carbons to produce a constant light. The device is particularly adapted for search-lights, magic lanterns, and the like. The mechanism consists of spring-actuated gearing which is operated automatically as the current is cut out by the burning away of the carbons.

Mechanical Devices.

DRIVING-GEAR FOR MOTOR-CARRIAGES. — ROBERT E. TWYFORD, Pittsburg, Penn. The objects of the invention are to produce a motor-carriage in which all the wheels can be used for traction purposes, in which a large variation in speed can be quickly obtained, and to provide a simple and effective brake and a power steering device controlled by a hand-lever and furnished with a safety mechanism which is designed to prevent too great a throw of the steering-axle. A single lever controls all the speeds, and reverses the carriage. More power can be profitably applied to driving the carriage, by making all the wheels driving wheels. The power-steering gear insures rapid and certain steering.

ADVERTISING DEVICE. — ALBAN HEIRON and LANCE J. TOFFELMIER, San Leandro, Cal. The device is actuated from a moving door in a store, railway-car, public building, or other place, and is arranged to display different advertisements in succession. The machine consists of an intermittently-revoluble cylinder on which advertising cards are carried. A star-wheel is mounted on the cylinder. With a slide moving transversely to the cylinder, a three-armed lever is connected. Shoes are engaged by opening or closing a door or window to impart a swinging motion to the three-armed lever and move the slide transversely in its bearings to impart an intermittently rotary motion to the star-wheel and cylinder.

EGG-BEATER.—THOMAS HOLT, Tarrytown, N. Y. Two ring-like beaters are so spaced that, when rotating, one side of a beater will pass into the circle of the other beater. Each of the beaters is transversely corrugated, with the opposite sides arranged at an inclination to the radial line. Guard-plates attached to the frame have their inner surfaces curved axially of the beaters.

VENDING-MACHINE. — WILLIAM McC. MACK, Bridgton, Me. The invention is a coin-controlled vending-machine for cigars. The machine is so arranged that a single cigar or a number of cigars can be discharged upon the deposit of a coin of certain value. The device for containing and vending the cigars comprises a number of boxes of different prices and grades. The coin-chutes are so constructed that any coin deposited, smaller than the coin for which the chute is intended will be discharged without placing the machine in operative condition.

HAT-SEWING MACHINE. — EDMOND G. O'DONNELL, Fall River, Mass. The sweat-band has heretofore been sewn into hats having a roll-brim, by hand, owing to the difficulty of reaching under the brim to the base of the crown, at which point the sweat-band is sewed. The inventor has overcome these objections in a machine having a frame comprising an upper arm and a lower arm, the former carrying the needle and presser-foot and being projected out beyond the latter arm, which serves to carry the work and also the stitch-forming devices. The needle and presser-foot bars are provided with arms projected inwardly to the end of the lower arm and carry the needle and presser-foot, so as to hold them under the brim of the hat and cause them to work at the very base of the crown.

ENVELOP-FEEDER. — WILLIAM J. BULMAN, Winnipeg, Manitoba, Canada. The invention is an improved device for automatically feeding envelops to a printing-machine. The feeder is adjustable to different sizes of envelops. The envelop-feeder comprises a base and a front board. Partitions are adjustably mounted on the front board, and envelop-supporting plates are carried on certain of the partitions; and adjustable stops on the other partitions. On a feeder-bar, longitudinally and transversely movable, feeder-blades are adjustably mounted and extended underneath the supporting-plates. Adjustable spring-fingers, movable upwardly, are carried by the blades.

Railway-Appliances.

MAIL-BAG CATCHER AND DELIVERER.—THOMAS F. MAGUIRE and ROBERT E. GLOVER, Portsmouth, Va. A swinging-arm is so mounted that when lowered it will be received by a seat-plate, and is provided with a cushion for the arm, arranged to sustain the back-jar of the arm in receiving a bag. The bag is caught by a receiver consisting of a fork having tines converging toward their inner ends, and provided at these ends with a recess to receive the bag-supporting ring and in advance of the recess, with a latch by which to secure the ring when in the recess. The arrangement of latch-devices operates to avoid any error in setting the bag to be caught by the train or the receiving devices in order properly to take the bag from the train.

AUTOMATIC SAFETY APPLIANCE FOR RAILWAYS.—GIDEON S. JEFFRIES, Reading, Penn. This invention is an improvement in a mechanism previously devised by Mr. Jeffries, in which the application of the air-brakes of a train can be controlled independently of the engineer or other person upon the train through the medium of an obstruction upon the track, whereby the air in the train-pipe is released to set the brakes. The improvements are to be found in the relation of the valve to the lever engaged by the track obstruction, the valve having a limited movement independently of the lever.

LOCOMOTIVE STEAM-BOILER.—EMMANUEL FOURÉ and HENRI THUILE, Alexandria, Egypt. The inventors have combined an electrical and a steam locomotive for the purpose of producing an engine of great power. The largest portion of the energy is furnished by steam directly led to the main driving-axles. Unquestionably the most important adjunct of an engine is the boiler. By means of their boiler, the inventors state that 2,000 horse power can be attained continuously and in working practice. The boiler in question is characterized by three superposed cylinders, the lower two of which are wholly tubular. The arrangement enables the inventors to employ driving-wheels of larger diameter than those at present in use, without alteration of the slide-valve mechanism.

AUTOMATIC AIR-PIPE COUPLING FOR CARS. —JOHN W. SPURLOCK, Ty Ty, Ga. The coupling-heads are rectangular in shape and are each provided with two prongs projecting from the lower corners of the head and having their inner and top faces beveled. A beveled prong projects from one upper corner of the head. The mating members of the coupling first engage their prongs with each other, these prongs serving as guides. The simple act of disconnecting two coupled cars will separate the coupling-heads and thus disconnect the air pipes. Pipes can be coupled even on curves.

Miscellaneous Inventions.

BINDER-FRAME.—HARVEY P. JONES, Chicago, Ill. By means of this binder-frame any number of loose leaves can be properly bound together, although any of the leaves can be removed when desired. The binder-frame comprises superimposed clamping-bars for clamping leaves between them. Posts are carried by one of the bars. Fixed guideways are located near one side of the other or movable bar. The posts extend through the movable bar and engage the fixed guideways. A right and left hand screw-rod is journaled in the movable bar. Clamping-nuts secure the posts opposite the fixed guideways. The clamping-bars are readily opened or closed for removing or inserting leaves and for securely binding the leaves together, one of the bars being locked to the other by means of the nuts and posts.

SOUND-REPRODUCER. — FREDERICK W. NOLTE, Victoria, British Columbia, Canada. The invention provides for phonographs, graphophones, and like instruments in which a gravity-reproducer is used, a reproducer by means of which the sound-waves can be taken from each side of the diaphragm in contradistinction to taking the sound-waves from only one side of the diaphragm.

PROCESS OF TREATING GOLD ORES.—CHARLES WETHERWAX, Best, N. Y. The ore is digested under steam-pressure in a solution of soluble glass with the addition of a caustic alkali. The gold is more completely liberated from its combination with other elements which render the ore difficult of treatment by the usual reagents, and is so prepared for recovery by the usual means.

BRAKE-SHOE.—JAMES F. MORRISON and ANDREW J. ALLEN, Chicago, Ill. The object of the invention is to provide a composition brake-shoe arranged to prevent the shoe from unduly wearing the tire of the wheel and from disintegration. The composition consists of comminuted iron, asphaltum, and sulfur to render the asphaltum impervious to oil or acid and to allow the shoe to be subjected to an increased temperature when in use.

DOOR-SPRING. — FRANCIS and HENRY F. KEIL, Bronx, New York city. In spiral door-springs, the block secured to one end of the spring is extended through a bracket in which it may rotate. The portion extended above the bracket is made angular or is provided with a channel to receive the head of a pin inserted in a hole in the bracket in order to hold the spring under its adjusted tension. These pins, being wholly detachable, are often lost. The present invention avoids these difficulties by so constructing the device that the holding-pin cannot be wholly detached by accident.

HORSESHOE AND PAD. — MICHAEL HALLANAN, Manhattan, New York city. The improvements devised by the inventor in horseshoe pads are designed to meet the views of horsemen who prefer ventilation. Automatic ventilation is effected by a yielding diaphragm, flexed at each step alternately to eject the air from an interior chamber and to draw in fresh air to the natural foot. The diaphragm is protected from undue strain by a guard flange, which receives the major portion of the wear.

A second pad has been patented by the inventor, which is constructed on new lines. The distinguishing feature is a leather shoe, built up in layers and combined with a rubber pad. The whole arrangement serves to minimize the jar on the horse's foot and to deaden the noise.

FLASH-LAMP.—CHARLES KLARY, Rue Taitbout 13, Paris, France. The apparatus which forms the subject of this invention is essentially characterized by combined devices for producing the instantaneous deflagration of the lighting or flash-powder and the subsequent operation of a smoke-retention device. A vivid light is obtained at exactly the proper moment without interference by the very strong emission of gas and smoke produced by the combustion of the lighting-powder. The apparatus is therefore suitable for photographic work.

BOX-CORNICE.—CHRISTIAN M. PRUSTMAN, Lexington, Neb. The cornice comprises a rake-molding and an eave-molding of different width. The rake-molding is arranged for attachment to the side of the rafter and at an angle thereto. The eave-molding is arranged for attachment to the square end of the rafter, the moldings being joined at the corner in miter-fashion. The construction is cheap; for it requires only two moldings of different width, joined together at the corner.

SHEARS.—JOHN T. SCHNORR, Sandusky, Ohio. The purpose of the invention is to provide shears in which the blades will cut true with a pronounced shear or draw cut and also prevent the edges from crossing each other and wearing away. The blade and handle of each section are in alinement. An arm or projection is extended laterally from each section and is situated at the bases of the blades. The arms are extended in the same direction and the sections are connected by a pivot-pin at the ends of the arms. A nipper-blade is attached to the end of each arm, the blades working with each other as the sections are moved on the pivot.

COMBINATION-TOOL.—PATRICK H. WALSH, Scranton, Penn. The tool is arranged to enable a carpenter readily to obtain various angles of timber, the length of rafters, and other desirable measurements when framing a house. The tool comprises blades standing at right angles and slidable one relatively to the other. A triangle has its sides pivotally connected, the hypotenuse being made in sections pivotally connected with each other and with the blades.

HUB-ATTACHING DEVICE.—JOHN A. WEITZEL and ULYSSES G. SMITH, Danville, Penn. The purpose of the invention is to provide a device for mounting hubs on spindles, and particularly for attaching vehicle-hubs to the spindles of the axles. To this end the inventors employ a collar with a locking device to hold it on the spindle, and a peculiarly-constructed pawl-and-ratchet device arranged to control the locking-device.

WOOD-PLANE.—HERBERT M. COE, Phœnix, Arizona Territory. The invention is an improvement in planes or spoke-shaves adapted for planing or shaving on circular or flat bodies. The plane-bit is secured upon a cross-block held in a frame. A flexible bed-plate extends rearwardly from the cross-block. The bed-plate can be readjusted to conform with the shape or size of the surface to be planed.

SHIRT.—WILLIAM R. CHAPLAIN, JR., Easton, Md. The invention provides a detachable bosom for shirts. By means of this arrangement one can use a number of bosoms of different fabrics or designs with a single shirt body or a smaller number of bodies without increasing the thickness of material at the bosom, at the same time avoiding a bulky appearance at the neck-band.

WOVEN FABRIC.—MAUD R. HARTZ, Ilchester, Md. The inventor has devised a fabric comprising bristles arranged in such manner as to provide a varying degree of flexibility transversely of the fabric, so that the garment lined with the fabric will have varying degrees of flexibility. This fabric is particularly adapted for shirt-collars, but is also useful for lining cloak and coat collars, or articles in which different degrees of stiffness are desired to retain the shape.

LUBRICATOR.—JAMES W. MCDONALD and ROBERT C. HAWLEY, Pueblo, Colo. The lubricator is of that class in which the lubricant is forced to the point to be lubricated by fluid-pressure, the lubricant being pumped into a tank in which the fluid pressure is established and from which the oil is fed. The lubricator comprises an oil-tank having a concave bottom. A steam-pipe leads into and extends nearly to the bottom of the tank. A sight-tube has connection with the tank and also with a steam-pipe. A pump supplies oil to the tank. A spring-pressed valve in the bottom of the tank is adapted to open and close with each stroke of the pump, whereby a uniform pressure and continuous feed of oil are obtained.

GARMENT-SUPPORTER. — JACOB A. THOMAS, Reading, Penn. The garment-supporter, for ladies' waists and skirts, consists of a belt and a base-plate having upper and lower flanges by which it is held on the belt. The flanges are formed with apertures; and one of the flanges is separated between its ends, a clip being formed between these separated sections. A pin is adapted for attachment to an upper garment and is secured to the clip. Inverted U-shaped clasps are adapted for attachment to the garment, having side members journaled in the apertures. Keepers are formed in the ends of one of the flanges and are adapted to engage with the other side members of the clasps.

DOOR-STOP.—FRANKLIN E. BEATTY, Philadelphia (Mount Airy), Penn. The invention comprises a catch of peculiar construction which is mounted upon the door-stop to hold the door open and which is released by shutting the door. The catch is held by a spring which will yield, when sufficient force is applied thereto, and thus act upon the catch to move it sidewise a sufficient distance to release it from the keeper.

BATH-CABINET.—ARCHIBALD C. FLOYD, Columbia, Tenn. The cabinet has a flexible cover and devices for holding the cover distended. The cover can be readily removed to be washed or stored in compact form. An automatic opening makes ingress and egress easy, so that the cabinet can be used without assistance and without danger of overheating.

HEN'S NEST.—WILLIAM R. PETTY, Carlisle, Neb. The nest comprises a box having one end partly closed. A gravity-door in the end is formed with a keeper on its inner face. A swinging partition depends from the top of the box; and a latch-rod on the partition is inserted through the end of the box to engage the keeper of the door, to hold the door in raised position. Stops limit the movement of the partition and prevent the withdrawal of the rod from the end of the box.

END-GATE FASTENING. — JAMES O. LEFEVRE, New Paltz, N. Y. The invention is a fastening which serves to secure the end-gate by drawing the side-boards of the wagon together, thus binding them against the edges of the end-gate. The invention involves novel features of construction by which a most effective appliance is produced.

FOLDING BRACKET-SHELF. — WILLIAM A. PETRIE, Petoskey, Mich. This shelf has a back frame with bearings and guideways. A shelf has a pintle mounted to turn in the bearings, the pintle terminating in crank-offsets. A brace is pivotally connected with the shelf at one end and is mounted to slide at its other end in the guideways. Springs on the back frame press the crank-offsets to hold the shelf in either an uppermost closed position or in a lowermost extended position.

ARTIFICIAL TOOTH.—THOMAS STEELE, Red Bank, N. J. The tooth is provided with a chamber and a slot in its under face communicating with the chamber. The inlay or fastening for the tooth consists of a body arranged to extend beyond the inner face of the tooth. A number of anchoring-arms project from the body and extend within the chamber of the tooth. The construction is such that the tooth, when forming a portion of bridgework, will be positively held against movement.

CARBURETER.—WILLIAM HENRY WOOD, Manhattan, New York city. This apparatus for generating illuminating and fuel gas comprises a tank containing a bell lifted by separate power and designed to descend by gravity. The bell is provided with an inlet-valve to admit air upon lifting the bell. A hydrocarbon is actuated by the bell, and a vaporizer has a valved connection with the interior of the bell to charge the vaporizer with air from the bell. The pump also discharges into the vaporizer to vaporize the hydrocarbon and to mix the vapors with the air to form the desired gas.

LOCK-GATE.—THOMAS T. STODDART, Ottawa, Ontario, Canada. The inventor has sought to provide an automatic lock-gate for canals, which will facilitate the opening and closing of the lock, and which will dispense with the use of chains, swinging arms, crab-wrenches, or moving machinery. The gate is hollow, and is mounted to swing in a vertical plane. The hollow shaft of the gate is arranged for connection with a fluid-supply. An air-pipe opens into the outer air and extends through the shaft. The pipe has branches opening into the gate. The gate, when filled with water, falls by gravity, whereupon the water is allowed to run off. By pumping out the air the gate rises.

TABLE-ADJUSTER.—WILLIAM H. WYATT, Manhattan, New York city. The purpose of the invention is to provide a device by means of which billiard tables can be quickly adjusted, without being subsequently disturbed by vibration either of the table or building. The inventor employs a screw with a sperical head set in a concave step. On these latter parts are interchanging ribs and grooves, disposed radially with respect to the axis of the screw and designed to hold the screw securely to prevent the effect of vibration.

MAGAZINE-CAMERA.—RELLA W. BALCH and JOHN J. MERRILL, Neillsville, Wis. The plates in this camera, after having been exposed, drop upon a bed or support which, unlike the supports of cameras hitherto constructed, form part of the magazine. Hence, when all the plates have been exposed, and have dropped, the support can be swung upwardly so as to restore the plates to the magazine. The construction has the advantage of enabling the photographer to remove the magazine with the exposed plates in broad daylight and to insert a new magazine.

WHIFFLETREE ATTACHMENT. — ERNST F. BAUERLE, Strong City, Kans. The purpose of the invention is to provide a means for preventing the falling of the reins beneath the singletrees, the invention being adapted particularly for use in connection with pairs or teams of horses. The device provided is a rein-guard, comprising a pivoted bar having its ends in slidable connection with the adjacent ends of the singletree.

CLAMP.—THEODORE DICKMAN, Wapakoneta, Ohio. The purpose of the invention is to provide a means for clamping together the parts of troughs and like structures which are built of staves held together by tie-rods. The invention is composed of a clamp-iron which engages the top staves and receives the strain of the cross and bolting tie rods.

FISHING-REEL AND REEL-REST.—JASPER HOWE, Tacoma, Wash. The reel, instead of being hung on the side of the rod as usual, is mounted in the center, so that the rod is balanced. Hence, in reeling, the crank is also at the center, and the customary wabbling is avoided. A simple form of click is provided which can be set hard and soft, whereby a running reel can be instantly obtained. A brake is substituted for the ordinary drag, which brake is operated by the little finger of the hand operating the rod, enabling the angler to bring a fish under control at all times. The gearing is mounted with the least possible friction, together with means for oiling.

Designs.

SPOON-HOLDER. — WILLIAM H. LOONIE, Wappinger's Falls, N. Y. The design provides a device for attachment to a vessel, which device is essentially a rest which prevents the spoon from falling into the vessel.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

NEW BOOKS ETC.

THE SHIPPING WORLD YEAR BOOK. A Desk Manual in Trade, Commerce and Navigation. Edited by Evan Rowland Jones. London: Shipping World Office. 1900. 12mo. Pp. 1184. Price $2.

This valuable book which is now published for the fourteenth time contains complete new tariffs of several countries, rules giving the loading of the several types of vessels, lists of vessels built or in the course of construction for the navies of the world, the world's shipping during 1899, a port directory of the world, various tables rules, etc., shipping laws and other information which cannot but prove of the greatest value to all who are engaged in, or in any way interested in navigation or shipping industries.

THE PRINCIPLES AND PRACTICE OF ARTIFICIAL ICE MAKING AND REFRIGERATION. By Lewis M. Schmidt, Ph.B. Philadelphia: Philadelphia Book Company. 1900. 8vo. Pp. 232. 87 illustrations. Price $2.50.

In the preparation of this volume the central idea has been to produce a representation of the status of the art of mechanical refrigeration and ice making as it is today. The book comprises the principles and general considerations of practice as shown by particular systems of apparatus; and insulation of cold storage and ice houses, refrigerators, etc., other useful information and tables. The book is a most excellent one, and is sure to be of the greatest possible value to all who manufacture, own or run ice-making plants. There is also a section

devoted to liquid air. There seems to be no immediate prospect of this becoming a serious competitor of ice.

INDICATOR DIAGRAMS. A Treatise on the Use of the Indicator and its Application to the Steam Engine. By W. W. F. Pullen. Manchester, England: Scientific Publishing Company. 1890. Price $2.40.

There are already a large number of books upon the indicator, but there always seems to be a genuine opportunity for a new and helpful contribution to the literature of this subject. The author gives the result of his experience and the large number of illustrations and reproductions of the diagrams will assist those who may be unfamiliar with the use of the indicator, to obtain a very competent knowledge of the subject.

KANT AND SPENCER. By Dr. Paul Carus. Chicago: Open Court Publishing Company. 1899. 16mo. Pp. 105. Price 20 cents.

Kant will ever have an important place in the history of modern philosophy, and the keynote of his success is thoroughness, holding that all philosophy must be based upon facts. Mr. Spencer on the contrary has been, according to Dr. Carus, deficient in thoroughness and earnestness.

VOLUMETRIC ANALYSIS. By John B. Coppock, T. C. S. London: Whittaker & Company. New York: The Macmillan Company. 16mo. Pp. 92. Price 50 cents.

This is specially adapted to the requirements of students entering the science and art courses in England, but the book will prove useful to American readers notwithstanding this drawback. It is one of the best and simplest treatises we have ever seen on the subject.

FERRIC AND HELIOGRAPHIC PROCESSES. A Handbook for Photographers, Draftsmen and Sun Printers. By George E. Brown, T. I. C. London: Dawborn & Ward, Limited. 1900. 16mo. Pp. 130. Price 80 cents.

This is a most valuable book in which are given examples of the work which can be turned out by various processes, including full directions for doing the same. A thoroughly practical book on this subject has been needed for some time.

GEOLOGICAL SURVEY OF CANADA. Annual Report. New Series. Vol. IX. 1897. Large 8vo. Pp. 1046, accompanied by 8 maps and 12 plates. Price 80 cents.

The portly volume before us gives an excellent idea of the work which is being done by the Geological Survey of Canada under the direction of G. M. Dawson, LL.D., F.R.S. The reports are fully illustrated and will prove of value to all who are interested in the wonderful mineral resources of Canada.

THE SOUL OF MAN. An Investigation of the Facts of Physiological and Experimental Psychology. By Dr. Paul Carus. Chicago: Open Court Publishing Company. 1900. 12mo. Pp. 482, 182 illustrations. Price 75 cents.

This is the second edition of an important book which is published in inexpensive form. The writings of Dr. Carus is well known.

THE SIXTH ANNUAL REPORT OF THE COMMISSIONER OF PUBLIC ROADS OF THE STATE OF NEW JERSEY. By Henry I. Budd, State Commissioner, Trenton, N. J. 1899. 8vo. Pp. 237.

The public roads of the State of New Jersey, together with those of Maryland, are in many ways the model roads of the United States, and the improvements which are constantly being made are most remarkable. The book is filled with valuable matter, many of the illustrations showing the roads before and after improvements were made. The figures, etc., which are given will prove of value to all those who are interested in good roads.

MAN AND THE COSMIC PRINCIPLE. By C. A. Bowsher. Champaign, Ill. 1899. 16mo. Pp. 155. Illustrated.

METEOROLOGICAL OBSERVATIONS MADE AT THE ADELAIDE OBSERVATORY AND OTHER PLACES IN SOUTH AUSTRALIA AND THE NORTHERN TERRITORY DURING THE YEAR 1896 UNDER THE DIRECTION OF CHARLES TODD. Adelaide. 1899. Quarto. Pp. 176, maps.

ELECTRIC WIRING. By Cecil P. Poole. New York: Power Publishing Company. 1900. 18mo. Pp. 101. Flexible leather. Price $1.

This book represents an honest effort upon the part of the author to explain the computations of wiring to the unitiated, and to present in shape for convenient reference tables and formulas for the use of engineers, including wiring tables for alternating current motors and tables showing the corrected drop in conductive circuits. The author has succeeded admirably in his efforts and the book will certainly be at the right hand of all those who have to work out the difficult problems of electrical wiring problems, which are increasing every year.

OFFICIAL PROCEEDINGS OF THE INTERNATIONAL COMMERCIAL CONGRESS. A Conference of all Nations for the Extension of Commercial Intercourse, held under the Auspices of the Philadelphia Commercial Museum in the City of Philadelphia. Philadelphia: Commercial Museum. 1899. Quarto. Pp. 442. Price $2.

As is well known, the International Commercial Congress was held in connection with the National Export Exposition, which was held in Philadelphia from October 12 to November 1, 1899. The volume before us is probably the most valuable reference book relative to our export trade which has ever been issued, giving as it does views of a vast number of delegates from thirty-eight foreign governments.

PRACTICAL STAIRCASE JOINERY. Edited by Paul N. Hasluck. New York: Cassell & Company. 1900. 16mo. Pp. 160. 180 illustrations. Price $1.

The editor has performed his task in a creditable manner, and it is one of the best and most easily understood books which we have seen on the subject. Stair building is not such a very intricate subject if the principles which underlie it are properly understood.

THE FILTRATION OF PUBLIC WATER SUPPLIES. By Allen Hazen. New York: John Wiley & Sons. 8vo. Pp. 321. Price $3.

There is no subject at present confronting the water-supply engineer more important than filtration, and the author has performed a signal service for engineers in the production of so admirable a book. That it is in its third edition is a sufficient guarantee of its excellence. The subject is making such rapid strides, and there is such a widespread interest in it, that it is to be hoped that a fourth edition outlining still further progress may be called for. It is profusely illustrated.

ELECTRIC WIRING, FITTING, SWITCHES AND LAMPS. By W. Perren Maycock, M.I.E.E. London: Whittaker & Company. New York: The Macmillan Company. 1899. 16mo. Pp. 466. Price $1.75.

This is a practical work for electric-light engineers, wiring and fitting contractors, consulting engineers, etc. It is profusely illustrated by 360 illustrations, and gives the wiring rules of the Institution of Electrical Engineers. Of course English practice is dealt with, but American engineers can gain many helpful facts from it.

AN INTRODUCTION TO THE STUDY OF CENTRAL STATION ELECTRICITY SUPPLY. By Albert Gay, M.I.E.E., and C. H. Yeaman, A.I.E.E. London: Whittaker & Company. New York: The Macmillan Company. 1899. 12mo. Pp. 467. Price $3.

A very timely work, dealing of course with English practice, but none the less valuable on this account. It is illustrated by 200 engravings. The book is written by two very practical electrical engineers, and the result of their labors is an eminently useful book dealing with the problems which are constantly occurring in all central station work. It is a book which can be recommended.

MAN AND HIS ANCESTOR. A STUDY IN EVOLUTION. By Charles Morris. New York: The Macmillan Company. 1900. 16mo. Pp. 238. Price $1.25.

An effort has been made in the present volume to present the subject of man's origin in a popular manner, to dwell on the various significant facts that have been discovered since Darwin's time, and to offer certain lines of evidence never before presented in this connection, and which seem to add much strength to the general argument. The subject is of widespread interest, so that the present brief and plain presentation of it will be acceptable.

THE CRIMINAL: HIS PERSONNEL AND ENVIRONMENT. A SCIENTIFIC STUDY. By August Drähms. With an introduction by Cesare Lombroso. New York: The Macmillan Company. 1900. 12mo. Pp. 402. Price $2.

There is no more serious problem confronting society than that of the criminal, and the classic works of Lombroso have revolutionized our ideas regarding the way they should be treated. Lombroso has set his seal upon the book and this is sufficient to emphasize its importance. The author, who is resident chaplain in the San Quentin Prison, Cal., has had ample opportunity for making exhaustive studies, and he has improved his opportunities so as to gather an almost unrivaled collection of data, which he has collated and arranged in readable form. The philosophy of crime, criminal classification and categories are all admirably treated, as well as demography of crime, hypnotism, punishment, reformation and prevention.

OUTLINES OF INDUSTRIAL CHEMISTRY. A TEXT-BOOK FOR STUDENTS. By Frank Hall Thorp, Ph.D. New York: The Macmillan Company. 8vo. Pp. 541. Price $3.50.

It was only a few months ago that we had occasion to review this admirable book, and now we have a new and revised edition. It should be at the right hand of every chemist and teacher. It contains some of the clearest expositions of intricate chemical processes we have ever seen. The good old-fashioned spelling is retained, and so furnishes a valuable example. We have nothing but praise for this book.

A MANUAL OF ZOOLOGY. By T. Jeffrey Parker, D.Sc., F.R.S., and William A. Haswell, M.A., D.Sc., F.R.S. New York: The Macmillan Company. 12mo. Pp. 563. Price $1.60.

It is a novelty to have a scientific book by New Zealand and Australian professors, but an examination of the book reflects great credit upon the authors. It has has been adapted for use in American schools and colleges. It is an excellent text book. The information is clearly and well set forth, and the illustrations admirably elucidate the text.

ON THE BUILDING AND MONUMENTAL STONES OF WISCONSIN. By Ernest Robertson Buckley, Ph.D. Wisconsin Geological and Natural History Survey. Madison, Wis. 1898. 8vo. Pp. 544.

An important report with splendidly executed plates. Although reports of this kind are of great local value, they are also of value to those who are in any way interesting in petrography or in building stones, even though they may live in another section of the country.

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated: correspondents will bear in mind that some answers require not a little research, and though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(7863) C. A. P. asks: How many feet of wire will it take to wind the armature of the alternator described in SCIENTIFIC AMERICAN, issued September 11, 1897. A. About 800 feet or two pounds.

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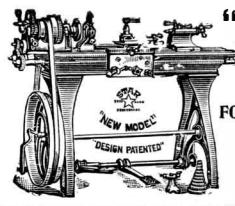

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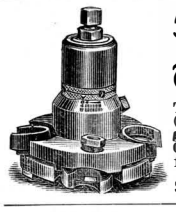

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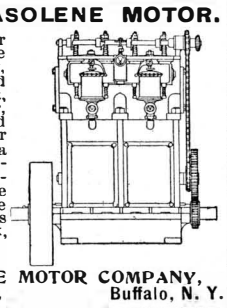

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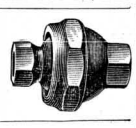

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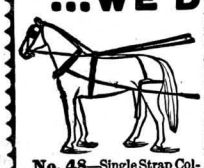

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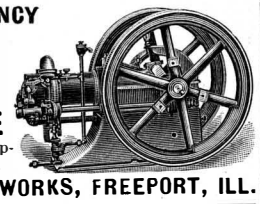

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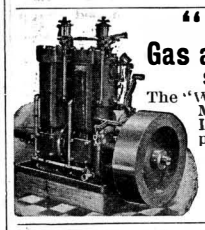

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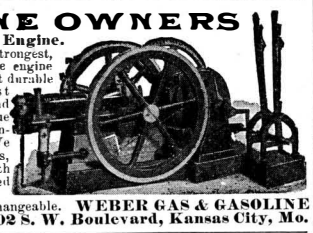

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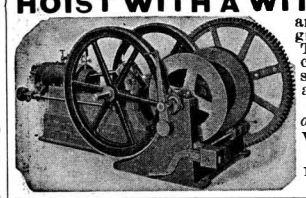

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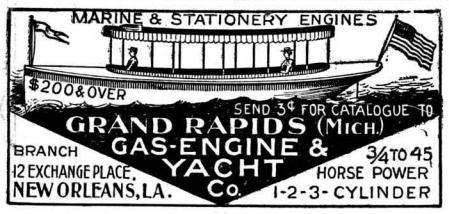

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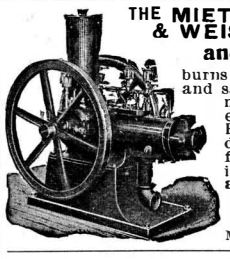

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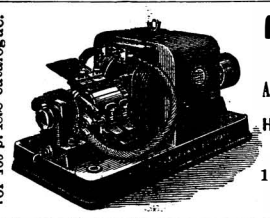

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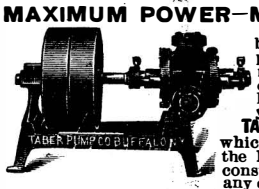

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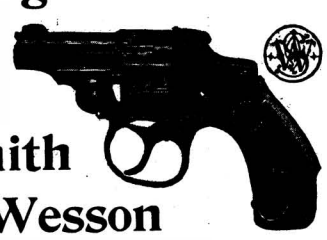

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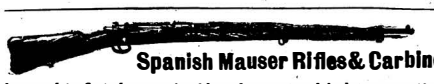

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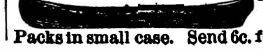

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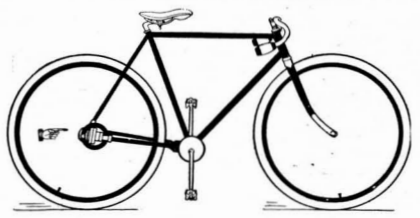

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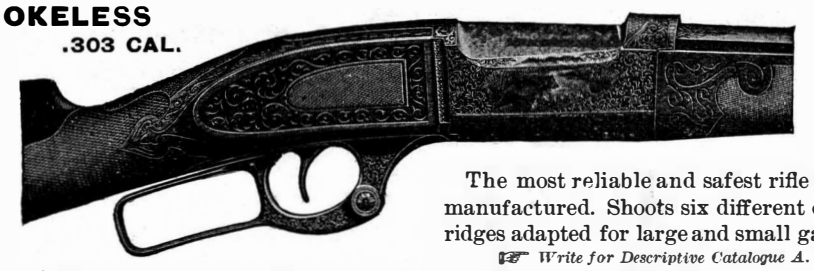

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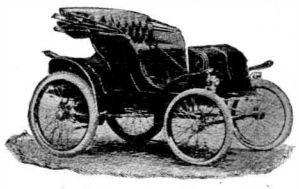

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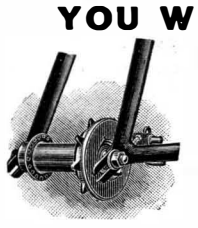

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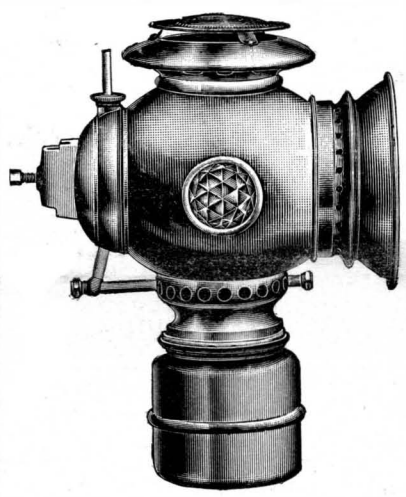

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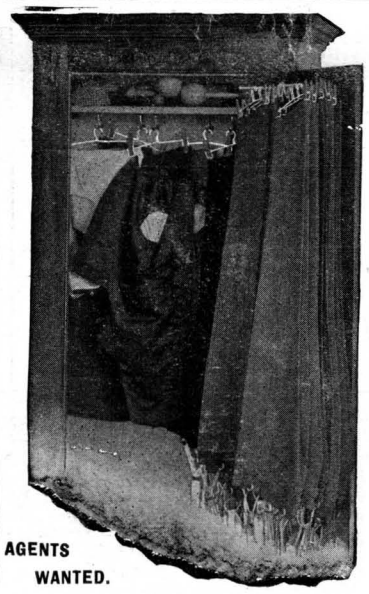

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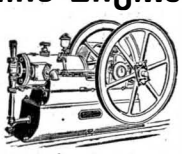

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